Water from the Rock:
The Role of Spirituality in the Lives of Black Women in Engineering Doctoral Programs

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Higher Education)
in The University of Michigan
2020

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DEDICATION

To my husband Christopher and my daughter Faith Simone, loving and being loved by you inspires me every day.

ACKNOWLEDGMENTS

To my Creator, ancestors, and angels, thank you for ordering my steps and placing the right people along my path to help usher me through this experience. I know that in this life I will never walk alone.

Heartfelt thanks to my family members, friends, and loved ones whose prayers and words of encouragement have lifted my spirits and motivated me to stay the course. For Christopher, my husband and true love, I have no doubt that God brought us together for a purpose. When I told you that I wanted to pursue my doctorate, you asked what *we* needed to do to make that happen. I adore you for that. Thank you for staying by my side through every stage of this journey and for your unwavering love, support, and confidence. To my daughter, Faith Simone, thank you for joining me for the last leg of this doctoral race. Your smiles fill me with immeasurable joy and hope for the future. You truly are the "substance of things hoped for and the evidence of things unseen" (Hebrews 11:1). To my parents, Gwendolyn and Charles Primous, thank you for modeling patience, perseverance, and indomitable faith. You have taught me that with God anything is possible. I carry you both in my heart and will always strive to make you proud. For my sister, Charlyn, thank you for being such a powerful role model in my life and for always being in my corner. I am blessed to be your little sister. Special thanks also to

my parents-in-law, Sharon and Esner Cousin and William Morton; siblings-in-law: Corey, Katrina, Omar, Glenn, Marie, Shauntae, Stanley (rest in peace); and my beautiful godchildren, nieces, and nephews. I love you all dearly.

I also would like to extend my sincere appreciation to my dissertation committee. To my Chair, Dr. Lisa Lattuca, thank you for trusting me to conduct this research in the way I envisioned and encouraging me to trust myself. Working with you throughout my doctoral program experience has strengthened my writing, refined my thinking, and made me a better scholar overall. I value your mentorship and I am immensely grateful to be a part of your "flock." To Dr. Phillip Bowman, thank you for your wise counsel, listening ear, and generosity with your time. I have treasured every conversation with you, whether it be about work, spirituality, family, history, or culture. To Dr. Tabbye Chavous, thank you for your intellectual curiosity and genuine excitement to engage new ideas. I look forward to continue working with you in the future. To Dr. Jacqueline Mattis, thank you for providing me with a disciplinary home away from home, and an academic family in the ELATED lab. I am also eternally grateful for your example as a scholar, mentor, sister, and child of God. To Dr. Camille Wilson thank you for introducing me to critical qualitative methodologies and for your intentionality and care in teaching and research. Your class has been and will continue to be an inspiration.

I offer my deepest gratitude to all those who have walked beside me during this doctoral journey. I would like to especially thank the members of the ELATED lab, Dr. Lattuca's research team, the Program on Intergroup Relations, Transforming Engineering Education Lab, National Center for Institutional Diversity, along with my mentors, teachers, cohort mates,

friends, former students, and classmates. Though too many to name here, know that this dissertation would not have been possible without you! I also wish to thank the Center for the Study of Higher and Postsecondary Education and the Rackham Graduate School for supporting my dissertation research.

Finally, to my participants, thank you for sharing your stories with me. Each of you has left a mark on my life that can never be erased. I am better for having met you. I pray that as you read this dissertation you are reminded of how brilliant and powerful you are.

PREFACE

The title “Water from the Rock” comes from Exodus Chapter 17 in the Bible. In this chapter, Moses strikes a rock from which water begins to flow for the Israelites during their time in the desert. Biblically, this moment symbolizes Jesus’ crucifixion after which the Holy Spirit is poured out as a gift for the world. Inspired by the symbolism of the rock and water in this passage, I imagine the context of engineering doctoral programs as a hard place for Black women and perhaps an unexpected environment for their spirituality to flow forth; however, in this study I examine just that.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

GLOSSARY OF TERMS

Historically Black Institution

Commonly referred to as Historically Black Colleges and Universities (HBCUs), I use historically Black institution to refer to this type of higher education institution.

Historically White Institution

I intentionally use the phrasing historically White institutions rather than predominantly White institutions to acknowledge the legacies of exclusion of marginalized groups, including Blacks, from these academic spaces (Smith, Hung, & Franklin, 2011).

Spirituality

For the purpose of this study, I refer to spirituality as: 1) a relationship between the self and transcendent forces; 2) connection between the self and others; and 3) the search for meaning and purpose in one's life.

Religiosity

Mattis (2000) defines religiosity as adherence to religious doctrine and practice, while referring to spirituality as "the internalization of, and the genuine and consistent commitment to, particular beliefs and values" (p. 118).

Transcendence

Stewart (1999) defines transcendence as "an ability to extend beyond the misfortunes and constraints of [Black's] existential condition" (p.32).

Liberation

Stewart (1999) defines liberation as "the capacity of Black people to actualize freedom under conditions of racism, domination, and dehumanization" (Stewart, 1999, p. 115).

Educational Resilience

Wang, Haertel, and Walberg (1994) define educational resilience as "the heightened likelihood of success in school and in other life accomplishments, despite environmental adversities, brought about by early traits, conditions, and experiences" (p. 46). Thus, when I refer to educational resilience I understand it as academic achievement despite adversity.

Epistemology

Referencing Harding (1987), Hill Collins (2000) defines epistemology as an "overarching theory of knowledge" (p. 252), which is influenced by the politics of power that determine who is believed and why.

Ontology

Ontology refers to a person's ways of seeing and being in the world (Shajahan, 2010).

ABSTRACT

Utilizing portraiture as a qualitative methodology, this study examines the role of spirituality in the lives of 16 Black doctoral women who are pursuing degrees in engineering at three institutions, two historically Black and one historically White. The goal of this study is to better understand Black women's spiritual epistemologies and ontologies in relation to their engineering work and lived experiences as doctoral students.

Cognizant of the unique intersections of oppression that Black women may experience in engineering educational environments, this study explores spirituality as a potential resource for these students. Elements of critical race theory (CRT), Black feminist thought, and endarkened feminist epistemology inform my epistemological, ontological, and methodological approach to this work. The study is also informed by empirical literatures pertaining to Black spirituality as well as the experiences of marginalized and minoritized students in STEM academic environments.

The use of portraiture in this study encouraged both systemic analysis and creative expression. Thus, in addition to systematically analyzing interview data through detailed coding, writing impressionistic records (i.e., memos), and identifying key themes, I also used spoken word poetry as a means of synthesizing and illustrating my findings while conveying the complexity and richness of my participants' narratives. Findings of this study demonstrate that spirituality played an integral role in the lives of Black women of faith pursuing their doctorates in engineering.

For study participants, spirituality offered a lens through which they saw, understood, and operated in the world. Their faith was not confined to particular space or time in their lives, but rather it informed their ongoing decisions, interactions with others, and sense-making. Spirituality also empowered participants to engage in resistance, resilience, and transcendence in engineering doctoral programs. Participants' faith emboldened them to exercise agency, assert themselves in advising relationships, employ spiritual strategies to combat mistreatment; while also encouraging them in trying times and reminding them they were overcomers. Moreover, spirituality helped many of these Black women find meaning and purpose in their engineering work, and see alignment between their spiritual and scientific epistemologies. Rather than divorcing the sacred from science, the majority of participants actively reconciled the two, recognizing how they could inform one another.

CHAPTER 1

Introduction

Black women in the United States have longstanding relationships with both spirituality and science. Deeply embedded in Black culture, spirituality influences the ways in which Black women of faith see, understand, and operate in the world around them. Conversely, science has largely influenced how Black women are seen, understood, and taught to operate in the world. Though predominant notions in Western society often position spirituality and science as diametrically opposed, I suggest that for Black women while tensions exist, there may also be areas of confluence. In this dissertation, I explore these areas of tension and confluence in an examination of the role of spirituality in the lives of Black women in engineering doctoral programs.

Throughout American history, Black women's relationship with science has often been contentious at best and deadly at its worst. For much of this history, Black women's intellectual, and at times physical, contributions to the advancement of science have been obscured and even erased. Only recently have contemporary griots, such as Margot Lee Shetterly and Rebecca Skloot, unearthed pivotal stories of Black women in science, technology, engineering, and mathematics (STEM) that were previously buried within the scientific community. Hopefully, the next generation of STEM professionals will know the stories of the Black women computers at the National Aeronautics and Space Administration (NASA) that propelled the United States

into outer space (Shetterly, 2016); or, the enduring legacy of Henrietta Lacks, a Black tobacco farmer, wife, and mother who died of cervical cancer, but whose cells continued to live well into the future and lay the groundwork for unparalleled scientific breakthroughs, such as the polio vaccine and genetic cloning (Skloot, 2010). Such stories provide a glimpse into Black women's complicated history with science.

While proponents of scientific racism contested Black women's intellectual capability to study science, Black women's actual bodies were subject to study and experimentation. As NASA, formerly known as the National Advisory Committee for Aeronautics (NACA), benefitted from the brainpower of Black women mathematicians like Katherine Johnson to build its space program (Shetterly, 2016), countless Black women were unknowingly subject to sterilization procedures in efforts to control and reduce their reproduction (Stern, 2005). As Henrietta Lacks sought treatment for her illness, her cells were harvested without her knowledge or consent, and then shipped and sold all over the world for science's gain while her identity was eventually lost in history (Skloot, 2010). Black women's longstanding engagement with and contributions to science are laced with erasure and violence, and although their experiences in STEM are gradually improving, many still encounter the lingering legacies of oppression in their fields of study.

In 1976, at an American Association for the Advancement of Science meeting, the term "double bind" was introduced to describe the unique intersection of racism and sexism that Women of Color experience in STEM disciplines (Ong, Wright, Espinosa, & Orfield, 2011). Current research regarding the experiences of Black women in STEM reveals that the double bind is alive and well. Exclusionary behaviors adopted by peers and faculty members contribute to feelings of social isolation among Black women in STEM, along with perceptions of

racialized and gendered discrimination (Carlone & Johnson, 2007; Charleston, George, Jackson, Berhanu, & Amechi, 2014; Fries-Britt & Holmes, 2011; Ko, Kachchaf, Hodari, & Ong, 2014; Ong, Wright, Espinosa, & Orfield, 2011). Furthermore, competitive and unsupportive departmental cultures (Ceglie, 2011), as well as the paucity of same-raced peers (National Academies, 2011) prove to be formidable obstacles for Black women in STEM to overcome. Additionally, intensive introductory and so-called weed-out courses in STEM that undermine collaboration and collegiality in the classroom (Borum and Walker, 2012; Ceglie, 2011) and negative interactions with intimidating and unapproachable faculty members (Ceglie, 2011) foster an unwelcoming learning environment for Black women. Harris (1993) suggests that Whites interested in protecting their power and privilege devalue the contributions of People of Color to preserve dominance. Therefore, the presence of Black women in STEM fields, which have historically been White and male-dominated, threatens the "property value of Whiteness" (the notion that whiteness itself can be used, enjoyed, and controlled) and maleness—creating tension. Such tension has the potential to create a hostile learning environment for Black women.

Though Black women's contributions and violations at the hands of science have frequently been trivialized and rendered invisible, Black women have and will continue to persist in STEM fields. To withstand and overcome the injustices which Black women have been subjected to in STEM, I argue that Black women can draw upon several resources, including spirituality.

According to Stewart (1999) resilience, resistance, and transcendence are inherent in an African American spiritual ontology. Stewart contends that in order for Blacks in America to survive the atrocities of slavery, they relied upon their spiritual ontologies to affirm their humanity and reify their commitment to liberation. Moreover, Black's spiritual realities give

them the capacity to achieve transcendence, which Stewart (1999) defines as "an ability to extend beyond the misfortunes and constraints of their existential condition" (p.32). Stewart suggests that the spiritual ontologies that preserved the sanity of Blacks' enslaved forebears persist among Blacks today, particularly in light of contemporary racism. In the words of Stewart (1999),

> African American Spirituality has not only been a creative survival mechanism for black people in America, it has also spawned a culture of belief; a style of existence that shapes an alternative transcendent consciousness, resisting complete domestication and assimilation by racism and oppression. (p. 21)

Therefore, I propose that Black women's spiritual ontologies help inspire their resilience, resistance, and transcendence in academic spaces. Stewart contends that spirituality provides Blacks with the ability to access an alternative transcendent consciousness that supersedes oppression. I argue that this alternative transcendent consciousness does not cause Blacks to ignore the material consequences of oppression, but rather gives them hope to imagine and work towards liberation. For Black doctoral women in engineering who identify themselves as spiritual, such spiritual ontologies may help them see beyond their present circumstances and imagine liberatory possibilities for themselves and others in their academic communities. Regarding this study, I submit that for many Black women, these spiritual epistemologies and ontologies encourage them to remain resilient, resist, and achieve transcendence in spite of the oppressive forces acting upon them in the engineering context.

Scholarship pertaining to spirituality among Blacks suggests that in African culture spirituality is intricately interwoven in every fact of life (Mbiti, 1990). Although Mbiti's (1990) work focuses on African culture specifically, aspects of this culture likely resonate with members

of the African diaspora, such as African Americans. For instance, research pertaining to Black women and spirituality has shown that spirituality is associated with various positive outcomes for Black women such as overall well-being and life satisfaction (Reed & Neville, 2014; Starks & Hughey, 2003), ability to cope with racism and discrimination (Brodsky, 2000; Cannon & Morton, 2015; Cooper, Thayer, & Waldstein, 2014), as well as other adverse or traumatic life events (Bacchus & Holley, 2004; Brodsky, 2000; Patton & McClure, 2009).

Given that spirituality plays such a vital role in the lives of Black people of faith, then the role of spirituality in the lives of Black women in STEM merits investigation. Furthermore, exploring the spirituality of Black women in STEM presents a unique opportunity to empirically contest dominant narratives that attempt to divorce the spiritual from the scientific. Utilizing portraiture (Lawrence-Lightfoot & Davis, 1997) as a method of inquiry, I conducted semi-structured interviews with Black doctoral women in engineering attending two historically Black institutions and one historically White institution to explore the role of spirituality in their lives. I focus specifically on Black doctoral women because to reach the graduate level of study, they have demonstrated considerable commitment to their fields, and have persisted in spite of potentially marginalizing disciplinary contexts. As a former engineering undergraduate and higher education professional supporting underrepresented and minoritized college students in STEM fields, I am familiar with STEM academic environments and the challenges they can present. Engineering, in particular, with its focus on math and science application, problem solving, and "making things" (Pawley, 2009) presents a unique context to examine Black women's epistemologies and ontologies. In engineering, prevalent epistemologies include positivism (Harding, 2005), meritocracy, and depoliticization (Cech, 2013) which may prove to be unwelcoming for Black women with more subjective, communal, and socially conscious

epistemological standpoints. For instance, positivism emphasizes rationality and logic as valid ways of knowing, which legitimates objectivity rather than subjectivity—the use of personal experiences, background, and culture to inform one's engineering work (Harding, 2005). Meritocracy valorizes individualism as opposed to communalism, contributing to perceptions that success is the result of natural talent and motivation (Cech, 2013). Furthermore, meritocracy ignores systemic barriers to Black women's access and success in STEM, such as unequal educational opportunities (Russell, 2005) as well and racial and gender discrimination (Fries-Britt & Holmes, 2011; Newman, 2011). Finally, depoliticization encourages the separation of science from political, social, and cultural issues as to not taint the purity of engineering design (Cech, 2013). Taken together, prevalent engineering epistemologies may be in tension with Black women's spiritual epistemologies and ontologies. Additionally, I am specifically interested in engineering due to the severe underrepresentation of Black women in the field (National Academies, 2011), which I argue is largely due to the interplay of racism and sexism operating in engineering that privileges White maleness and attempts to exclude Black women.

The goal of this study was to highlight the spiritual epistemologies and ontologies of Black women in engineering doctoral programs. In this study, I answered the following research questions:

What role does spirituality play in the lives of Black women in engineering doctoral programs?

1) How do Black women in engineering doctoral programs understand, describe, and express their spirituality? When, where, and with whom do Black women in engineering express their spirituality?
2) To what extent, and in what ways, does spirituality inform resilience, resistance, and transcendence among Black women pursuing engineering doctorates?

a) How do Black women in engineering doctoral programs describe their experience in their educational environment, and how does spirituality help them to navigate the challenges and assets of that context?

b) How are race and/or gender implicated in the challenges and successes that Black women in engineering experience, and how does spirituality help them to navigate those particular challenges?

3) How, if at all, is spirituality implicated in Black women's work as engineers (e.g., in their knowledge claims, in the ways that they understand what is valid, in the creative process, in problem-solving, and in engaging others in collaborative processes)? To what extent do Black women in engineering experience conflicts between spiritual and scientific epistemologies?

In Chapter 2, I discuss extant literature pertaining to Blacks' conceptualizations of spirituality, and more specifically Black women's spirituality. I also review scholarship regarding Black women's educational experiences in STEM fields, and delve into critical perspectives concerning the valuation of knowledge and ontology in scientific communities to ground my exploration of the role of spirituality in the lives of Black women pursuing engineering doctorates.

A Critical Approach to Studying Black Doctoral Women's Experiences in Engineering

In this dissertation, I weave together elements of critical race theory (CRT), Black feminist thought, and endarkened feminist epistemology to explicate my epistemological, ontological, and methodological approach to this work. In the sections that follow, I elaborate on the tenets of CRT, Black feminist thought, and endarkened feminist epistemology.

Critical Race Theory

Although the tenets of critical race theory (CRT) vary slightly depending on the context in which they are being applied, the following have been utilized by education scholars: commitment to social justice, critique of liberalism, persistence of racism, counterstorytelling, and whiteness as property (Ladson-Billings, 1998; Solórzano & Delgado Bernal, 2001; Solórzano & Yosso, 2002; Yosso, 2006; Zamudio, Russell, Rios, & Bridgeman, 2011).

Critical race scholars assert that a strong commitment to social justice is an integral component of transformational resistance in institutions such as education (Solórzano & Delgado Bernal, 2001). My proposed study is strongly motivated by my commitment to social justice. Through this work, I hope to further legitimize Black women's spiritual ways of knowing, seeing, and being in this world, particularly in engineering environments where Black women are often discredited as agents of knowledge.

Critical race scholars also question if the ideals of freedom, equality, and individual rights that are associated with liberalism are actually achievable for marginalized groups who are not operating in a truly fair and egalitarian society. From a CRT perspective, notions of meritocracy and resistance to structural interventions to protect the rights of minoritized groups, serve to reify societal systems of inequity and privilege those in dominant group (Zamudio et al., 2011). By centering the experiences of Black women in engineering doctoral programs, I examine the ways in which Black women navigate fields predominated by White men as members of a marginalized racial and gender group. Furthermore, I examine how Black women's spiritual epistemologies and ontologies relate to those espoused by their fields, such as meritocracy and depoliticization (Cech, 2013) which align with notions of liberalism.

The persistence of racism refers to the endemic nature of racism in U.S. society (Ladson-Billings, 1998). In this study, I assert that engineering as a field, with its legacies of exclusion and marginalization of Black women, includes cultural milieus that influence the educational experiences of Black women today. I recruited participants from both historically White and Black institutions, to explore if and how Black women experience the persistence of racism in their respective educational contexts. Though Black doctoral women in engineering attending historically Black institutions may be insulated from racial discrimination in their local environment (e.g. within predominantly Black campuses), they are still situated within a broader disciplinary culture that has historically excluded Black women and delegitimized their intellectual contributions. As such, Black women's presence in engineering may remain subject to question and threat in both historically Black and White institutional environments.

Counterstorytelling places the lived experiences of People of Color at the center in an effort to challenge dominant narratives (DeCuir & Dixson, 2004; Ladson-Billings, 1998). By focusing on the role of spirituality in the lives of Black women in doctoral engineering programs, I highlight the cultural and epistemological assets that Black women carry with them into engineering environments. I also challenge dominant narratives concerning Black women's invisibility in the "hard sciences," by centering the stories of educationally resilient Black doctoral women in engineering.

According to Harris (1993), whiteness itself functions similarly to property in that it can be possessed, used, enjoyed, and controlled. Thus, in institutions that are dominated by Whites, those in power determine the precise value of whiteness in such spaces. In education, STEM departments might exercise such power by ignoring the cultural epistemologies of People of Color, and privileging mainstream systems of knowledge. For example, in STEM the scientific

method has power, whereas more cultural ways of knowing, such as spirituality, may be considered taboo or inappropriate to discuss in such environments. However, in this study of the role of spirituality in the lives of Black doctoral women in engineering, I bring the Black epistemological viewpoints of my participants to the forefront. Additionally, I ground my approach as a researcher in CRT, Black feminist thought, and endarkened feminist epistemology in an effort to disrupt the valuation of mainstream paradigms and the reproduction of White power in social science research.

Black Feminist Thought

As Hill Collins (2000) asserts, within Black feminist epistemology exists a set of principles Black women use to assess and validate knowledge claims. These principles are derived from the collective wisdom of Black women, which Hill Collins suggests is established through the sharing and preservation of Black women's experiences throughout history (Hill Collins, 2000). From a Black feminist epistemological standpoint, *lived experience* is a criterion of meaning. Additionally, *dialogue* is used to assess knowledge claims. Finally, *ethics of care* and *personal accountability* are inherent in the knowledge validation process. According to Hill Collins (2000), lived experience confers credibility and believability to someone positioning herself as an expert on a particular topic. Further, through dialogue ideas are examined and proven through conversation with others as opposed to isolation. The ethic of care is comprised of three components: personal expressiveness, emotion, and empathy. Personal expressiveness speaks to the value of individual uniqueness within Black communities. Emotion serves as evidence of the speaker's belief in the validity of her argument. Empathy refers to a Black woman's ability see herself in another's experience and thereby better understand that person. The ethic of personal accountability refers to the expectation that a person is responsible for her

knowledge claims, which makes that person's character, values, and ethics subject to evaluation (Hill Collins, 2000). Informed by Black feminist thought, I also look to endarkened feminist epistemology to guide my philosophical and methodological approach as a researcher.

Endarkened Feminist Epistemology

Rooted in Black feminist scholarship, endarkened feminist epistemology aims to disrupt what is considered known and taken for granted concerning educational research (Dillard, 2000; 2006). Central to an endarkened feminist epistemology is a critique of the "violence perpetuated in the universal generalization from the particular White male knowledge of the nature of reality to describe everyone's realities, including those Black and female" (Dillard, 2006, p.17). Further, *endarkened* is intentionally used to describe such an epistemology in an effort to encourage the use of new language that describes the knowledge and lived realities of African American women, including the unique intersections of identity and oppression, from a Black feminist thought perspective (Dillard, 2000; 2006). Dillard (2000) explained:

> In contrast with the common use of the term "enlightened" as a way of expressing the having of new and important feminist insights (arising historically from the well-established canon of White feminist thought), I use the term *endarkened* feminist epistemology to articulate how reality is known when based in the historical roots of Black feminist thought, embodying a distinguishable difference in cultural standpoint, located in the intersection/overlap of the culturally constructed socializations of race, gender, and other identities and the historical and contemporary contexts of oppressions and resistance for African-American women. (p. 662)

Moreover, an endarkened feminist epistemology draws on a spiritual tradition in acknowledgement of Black women's historical and contemporary reliance on various forms of

spirituality to resist oppression and find purpose in their pursuits (Dillard, 2000; 2006). An endarkened feminist epistemology also recognizes that individuals, though unique, possess a common spirit imbuing them with inherent worth and validating their expressed truths (Dillard, 2006). Situated in an Afrocentric worldview, from an endarkened feminist epistemological perspective, "one's selfhood is understood and constituted as body, mind, and spirit and affirmed in relationship to both one's group and one's creator" (Dillard, 2006, p. 32).

As I explored the relationship between Black women's spirituality and resilience in historically White and Black institutions, endarkened feminist epistemology framed my philosophical approach as a researcher. In this study, I engaged in what Dillard (2006) calls *methodology of surrender*. According to Dillard, methodology of surrender entails embracing a meditative and faith-filled research space that promotes love, compassion, reciprocity, and ritual. Love involves re-conceptualizing the researcher/participant relationship. To love the people or communities that one is researching, the researcher must look and listen carefully to her participants in order recognize their truths. Compassion refers to the "intention and capacity to relieve and transform suffering through our research work" (Dillard, 2006, p. 84). As a researcher, being compassionate towards the people or communities one is researching means caring deeply and desiring to bring them joy. Reciprocity entails bridging the divide between the researcher and the participant by recognizing all human beings as equal and eradicating the artificial boundaries created to distance oneself from another. Finally, ritual involves "unifying the human and the divine" (Dillard, 2006, p. 85). To engage in a ritual involves remembering that research is not only an intellectual pursuit, but also a spiritual one.

Study Contribution

Currently, there is limited scholarship pertaining to the spirituality of Black students in higher education. This study contributes to the literature in this area by exploring the role of spirituality in the lives of Black women in engineering doctoral programs. To my knowledge, this is one of the only studies that explicitly examines the spiritual epistemologies and ontologies of Black women engineering contexts. Centering Black women's spirituality in engineering, introduces new considerations regarding the creation of more inclusive and inviting educational environments for Black women in STEM that embrace Black women's spiritual epistemologies and ontologies. Additionally, understanding the ways in which Black women may use their spirituality to overcome potentially marginalizing educational environments provides insight on Black women's persistence in STEM fields and informs theorization in this area. Theoretically, this research braids critical race theory (Ladson-Billings, 1998; Solórzano & Delgado Bernal, 2001; Solórzano & Yosso, 2002; Yosso, 2006; Zamudio, Russell, Rios, & Bridgeman, 2011), endarkened feminist epistemology (Dillard, 2000; 2006), Black feminist thought (Hill Collins, 2000), and portraiture (Lawrence-Lightfoot & Davis, 1997) together to examine the role of spirituality in the lives of Black doctoral women in engineering. The findings make evident the need for further exploration of how Black women's intersecting identities—and oppressions—inform their spiritual epistemologies and ontologies; for instance, how they view transcendent forces and themselves in relation to such forces. This study also creates space for theorizing how Black women's spiritual and scientific epistemologies and ontologies co-exist rather than treating them separately, or presuming their opposition; particularly regarding Black women's ability to hold their spiritual and scientific ways of knowing in tension, as well as reconcile them. Methodologically, the conceptual frameworks and portraiture (Lawrence-Lightfoot & Davis,

1997) complemented each other well and allowed me as a researcher to search for the goodness of my participants (Lawrence-Lightfoot & Davis, 1997); act with love and reciprocity (Dillard, 2006); as well as embrace an ethic of care and accountability (Hill Collins, 2000). Moreover, my use of spoken word as a form of portrait to illustrate themes and create a mosaic of participants' experiences is an extension of portraiture. Spoken word helped me synthesize my research findings and meaningfully engage audiences within and outside of academia. Further, spoken word provided a means to overcome the challenge of rendering a coherent and cohesive portrait of the various contexts, narratives, and experiences of participants. Altogether, this study aims to disrupt dominant narratives concerning the dichotomization of spirituality and science and creates space to discuss the epistemological and ontological assets of Black women.

CHAPTER 2

Literature Review

Conceptualizations of Spirituality among Blacks

Transcending the confines of a particular religious tradition, spirituality acts as a multidimensional, relational construct (Mattis, 2000) that manifests in myriad ways for Blacks. For example, Blacks have historically relied on spirituality to inform their understandings of "forgiveness, liberation, hope, justice, salvation, the meaning and purpose of life, and their responses to oppression" (Mattis, 2000, p. 102). Moreover, spirituality's significance in the lives of Black Americans, particularly, cannot be underestimated.

America's history of racism in the interest of maintaining White supremacy has resulted in the dehumanization, subjugation, and exploitation of Black people for centuries (Kendi, 2017). Black oppression in a United States (U.S.) context is largely driven by racist ideas that perpetuate myths of Black's biological, cultural, and behavioral inferiority to Whites (Kendi, 2017). However, Black people have managed to withstand, and even resist such devaluations of their culture and humanity. Religious scholar Stewart (1999) asserts that Black Americans' ability to survive chattel slavery and remain resilient despite enduring legacies of oppression in the U.S. can be attributed to spirituality. In Stewart's (1999) conceptual framing of spirituality and its relationship to Black consciousness, he asserts that African Americans possess a unique

"soul force spirit" (p. 3) that serves as a reference point for Black existence. Elaborating on the manifestations of soul force spirit in the lives of African Americans, Stewart writes:

> This spirit permeates black life and instills in African American people a will to survive; a desire to confront and surmount all threats to their being and existence while concurrently creating idioms of life and culture which provide them with adaptive mechanisms that reinforce their sanity, affirm their wholeness, and establish their spiritual and ontological location in American society. (p. 3)

Examining spiritual ontology from an African perspective, Mbiti (1990), suggests that spirituality is imbued in every facet of life. Mbiti (1990) writes, "Because traditional [African] religions permeate all departments of life, there is no formal distinction between the sacred and the secular, between the religious and non-religious, between the spiritual and the material areas of life (p. 2). Taken together, Stewart (1999) and Mbiti's (1990) work suggests that individuals of African descent share an understanding that spirituality encompasses much more than a particular belief system and associated practices, but rather constitutes a way of seeing, understanding, and operating in the world. From this perspective, the focus shifts from what it means for people of African descent to *be* spiritual, to what it means to exist and understand oneself as a spiritual being. As Mbiti proposes, for people of African descent, the spiritual cannot be divorced from the secular because it is inextricably interwoven in every aspect of life.

In Milner's (2006) introduction of a reflective model of racial, cultural, and spiritual engagement to inform more empowering research practice with African American participants, he echoes Stewart's (1999) notion of spirituality as a means for Black survival by arguing that in order for Blacks to endure the atrocities of slavery and pervasive racism of the Jim Crow era they had to be attuned to their spiritual selves. However, Stewart moves beyond spirituality's role in

supporting Black people's survival, to its inspiration of their hopes for liberation. According to Stewart (1999),

> It is because the black church and black spirituality have encouraged black people to practice spiritual and cultural freedom through the creation of a culture of creativity and spirituality that sublimates, transforms, and ultimately transcends the constraints of racism, oppression, and dehumanization into a positive force for life that African Americans have been free to choose their terms of response to their condition. (p. 119)

Jagers and Smith (1996), Stewart (1999), and Milner (2006) agree that spirituality is intrinsically connected to Black culture and has been used as a means for Blacks to resist oppression, which suggests that spirituality is integral in Blacks' *critical race-gendered epistemologies* (Bernal, 2002), or systems of knowledge. Bernal (2002) refers to critical-race gendered epistemologies as the ways in which People of Color know and understand the world based on their unique vantage point as racialized and gendered beings. These critical race-gendered epistemologies "emerge from the experiences a Person of Color might have at the intersection of racism, sexism, classism, and other oppressions" (Bernal, 2002, p. 107). In acknowledging spirituality as a form of knowledge in Blacks' broader systems of knowing, exploring how this knowledge is shared and cultivated is a valuable contribution to the extant literature on this topic.

Despite within-group differences in religious affiliation, country of origin, educational attainment, age, and gender, researchers have demonstrated the overarching salience of spirituality among Blacks (Dennis et al., 2005; Taylor et al., 2009; Stewart, 2002; Walker & Dixon, 2002). In a nationally representative survey study of 3,570 African Americans in the U.S., Taylor and colleagues (2009) found that approximately 8 out of 10 African Americans and Caribbean Blacks in the U.S. considered spirituality to be very important in their lives.

Furthermore, contemporary scholars have documented Blacks' utilization of spirituality in coping (Patton & McClure, 2009; Watt, 2003), meaning making (Mattis, 2002; Mattis & Watson, 2009), overcoming discrimination (Cannon & Morton, 2015; Herndon, 2003), and providing a sense of purpose (Donahoo, 2011; Herndon, 2003; Jett, 2010; Watson, 2006). It is apparent that spirituality has served as a source of strength, resistance, creativity, and hope for Blacks. Therefore, the ways in which spirituality is conceptualized in the Black community merits further exploration.

Highly subjective and complex, spirituality is difficult to define. However, researchers must grapple with their conceptualizations of spirituality and those of their participants to ensure that they are not misinterpreting their findings. Though scholars have not reached consensus on a universal definition of spirituality, there are commonalities in conceptualizations of spirituality among Blacks. After examining conceptual and empirical literature pertaining to Black spirituality, three themes emerged. Spirituality as: 1) a relationship between the self and transcendent forces; 2) connection between the self and others; and 3) the search for meaning and purpose in one's life. Although these conceptualizations of spirituality may not be solely limited to members of the Black community, they appear to be integral to Blacks' understandings of spirituality based on their prevalence in scholarship. Additionally, it is important to note that these conceptualizations are not mutually exclusive. They work together to describe Blacks' holistic and communal approach to spirituality. I will elaborate on each theme in the subsections that follow.

Relationship Between Self and Transcendent Forces

In a review of extant literature regarding the roles of spirituality and religiosity in influencing the psychological health of African Americans, Mattis and Watson (2009) suggest

that spiritual Blacks' belief in transcendent forces facilitates personal connection to the divine and sacred, which can include God, spirits, or ancestors. Mattis' (2000) reported similar findings in her two-part qualitative exploration of 128 African American women's written definitions of religiosity and spirituality, followed by in-depth interviews with a subsample of 21 women. Mattis found that participants who expressed awareness of a transcendent dimension of life believed that humans have the ability to tap into knowledge and power that could not be easily explained by science. For Blacks who believe in a higher power or transcendent forces, this belief becomes a source of hope, because there is an understanding that they are not relying solely on their strength to overcome adversity. One of Mattis' (2000) participants spoke of the confidence her spirituality afforded her in facing challenges, "Spirituality is power... Until that point where that inner being comes together with the consciousness I call God—when I tap into that power there is no limit to what I can do" (p. 116). This participant believed that her relationship with a transcendent force, or God, multiplied her own inner strength, giving her the confidence to achieve any goal she set her mind to. Jagers and Mock's (1993) definition of spirituality from an Afrocultural perspective supports Mattis' (2000) work, by including that being spiritual entails "believing and behaving as if nonobservable and nonmaterial life forces have governing power in one's everyday affairs" (p. 394). In other words, spiritual people are sensitive to the interplay between supernatural and natural forces operating in their lives. In the case of Mattis' (2000) participant, she believed that such forces work in conjunction with humans, imbuing them with power to succeed in the natural realm.

Black collegians' beliefs in transcendent forces are important to examine in higher education because such studies can shed light on how students interpret and overcome challenging circumstances in the academic environment. In Patton and McClure's (2009)

phenomenological qualitative study on the role of spirituality in the lives of 14 African American women, a participant referred to the intercession of transcendent forces in human life by defining spirituality as a "belief in a higher being, some kind of higher authority that is being answered to or something to find comfort in or turn to for guidance and help" (p. 48). When distressed, this student did not mention seeking counseling or other institutional support services to address her concerns, she chose instead to approach a higher power for direction, support, and comfort. This student's response is important to consider for higher education researchers interested in cultural coping mechanisms employed by Black students. Additionally, this particular participant's comments denoted a sense of accountability and assurance that she found in a more authoritarian conception of a higher power.

For Blacks who embrace liberation theologies, it is clear that inspiration and instruction regarding overcoming adversity are often found in the stories of prominent figures in religious texts, such as the Bible or Q'uran (Mattis & Watson, 2009; Morris, 2004). However, it is not strict adherence to religious doctrine that inspires confidence and hope in believers, but rather a sense of intimate relationship with a higher power, or transcendent force that has consistently demonstrated prevailing love and concern for humanity (Mattis & Watson, 2009). Transcendent forces can also be associated with creation ideologies. In Watson's (2006) survey study of the role of religion and spirituality in the lives of 46 African American college males, he succinctly defines spirituality as a belief in an "external animating force" (p. 113), which adds a life-giving dimension to the role of a transcendent force. Therefore, a transcendent force can also be viewed as a creator, which is not only responsible for human life, but all living things. In sum, this particular conceptualization of spirituality emphasizes the empowerment and assurance experienced by Blacks who find strength and hope in the knowledge that transcendent forces,

with which they have connection to, have influence in the natural and supernatural realm. These forces are believed to operate in the interest of the greater good in Blacks' lives.

Connection between Self and Others

Scholarship concerning Blacks' expressions of spirituality, consistently points to notions of interdependence and connection with others (Herndon, 2003; Lewis et al., 2007; Mattis, 2000, 2001, 2002; Patton & McClure, 2009). In Jagers and Mock's (1993) quantitative investigation of the cultural orientations of 50 inner-city African American sixth graders, the authors identify communalism and spirituality as two components of an Afrocultural psychological orientation, which reflects the cultural values, beliefs, and behaviors of people of African descent. Communalism emphasizes the importance of social relationships and group membership in shaping one's identity, and spirituality connotes a belief that all elements of reality possess a life force (Jagers & Mock, 1993), implying that all living things possess an inherent worth. Being that communalism and spirituality are both aspects of an Afrocultural psychological orientation, it is likely that these constructs have a reciprocal relationship, which influences expressions of both.

Studies regarding Blacks' understandings of spirituality support this assumption of a reciprocal relationship by indicating that one of the ways Blacks demonstrate their spirituality is by connecting with other people. One of the participants in Patton and McClure's (2009) qualitative study on the role of spirituality in 14 African American college women's lives, shared "[spirituality] is believing in connectedness; you're connected to the world and individuals in it" (p. 48). For this participant, and several others in Patton and McClure's study, spirituality was understood to be relational. To be spiritual included not only a connection between self and a higher power, but also a relationship between self and others. Participants in Lewis et al.'s

(2007) qualitative study of 12 African American's expressions of spirituality also discussed the importance of person-to-person relationships, by conceptualizing spirituality as a process of honoring others. Lewis et al. found that participants conveyed their spirituality through acts of service in their communities and practicing unconditional love by embracing others regardless of their race, religion, or sexual orientation. Moreover, Mattis (2000) found that several of the Black women in her qualitative study associated spirituality with networks of support that included connections with a higher power, ancestors, and the living. For Mattis' participants, spirituality gave them confidence that they would not need to face life's challenges alone. The importance of connection with others was also echoed by participants in Borum's (2012) qualitative, exploratory study of 40 African American college women, who relied on spiritual support networks to resist feelings of depression and loneliness experienced at their historically White institution.

Search for Meaning and Purpose

Beyond the relational aspects of spirituality, there is also an internal process that entails discovering one's purpose and making meaning of life experiences (Mattis, 2000). This internal process is particularly important for Black students in higher education who are making critical decisions about the type of professionals and people they hope to become in the future. Drawing on the findings from her in-depth interviews with 21 African American women regarding their definitions of spirituality and religiosity, Mattis (2000) writes, "spirituality also denotes a journey of self-reflection, self-criticism, and self-awareness that culminates in a greater understanding of the relationship between self, God, and the larger community" (p. 118). As Mattis describes it, being spiritual involves serious introspection that facilitates meaning making for individuals. Additionally, in Stewart's (2002) qualitative exploration of the role of faith in

five Black students' sociocultural identity integration, she asserts that the foundation of spirituality is to find coherence in the fragmentation of human life. Seeking wholeness, or striving to achieve identity integration in the various roles, relationships, and responsibilities one has is a crucial aspect of spirituality (Stewart, 2002). Scholars of Black spirituality, such as Berkel et al. (2004) and Riggins et al. (2008) also endorse conceptualizations of spirituality that refer to seeking meaning and purpose in life. Empirical research on Black spirituality further demonstrates the importance of the search for meaning and purpose in Blacks' lives.

Studies in psychology and higher education have shown that for Blacks the pursuit of direction, meaning, and purpose are central components to leading a spiritual life. Findings from Harley and Hunn's (2014) qualitative exploration of spirituality among 16 low-income African American adolescents suggest that spirituality involves an increased understanding of the meaning of life and death, as well as recognition that there is greater meaning to life than self-gratification. Participants in Herndon's (2003) grounded theory qualitative study of 13 African American college men's expressions of spirituality shared that their spiritual beliefs gave them a sense of purpose and direction. One participant stated that his spirituality helped him refine his "mission" in life, and better understand how it relates to his academic goals (p. 80). Mattis (2000) also found that her Black female participants included personal quests for purpose, destiny, and meaning in their definitions of spirituality. Seeking meaning and purpose in life as manifestations of spirituality was further supported in Mattis' (2002) qualitative study concerning 23 Black women's uses of spirituality in coping and grappling with life circumstances. One participant shared,

> [Spirituality] gives you that grace and that strength to deal with the reality of issues and to come out of them having learned some kind of lesson. And, to keep you whole. And, if you're fortunate and open, you can actually have grown. (Mattis, 2002, p. 313)

This participant's comments suggest that spirituality allows her to reframe life's challenges into teachable moments, which can be a source of growth and wholeness.

Now that I have described three key conceptualizations of spirituality among Blacks as revealed from current literature—belief in transcendent forces, connection between self and others, and the search for meaning and purpose in one's life—I will discuss scholarship pertaining to the spirituality of Black women in particular. In the section that follows, I examine spirituality's influence on Black women's mental and physical health outcomes, responses to adversity, and ability to cope with racism and discrimination.

Black Women and Spirituality

Scholarship pertaining to the spirituality and religiosity of Black women reveals the salience of these resources in Black women's lives (Taylor, Chatters, & Jackson 2009; Taylor, Chatters, & Brown, 2014). Research has demonstrated the prevalence of spirituality and religiosity among Black Americans generally, but Black women have been found to be more spiritual and have higher levels of religious participation their male counterparts (Taylor, Chatters, & Jackson 2009; Taylor, Chatters, & Brown, 2014). Current literature would suggest that for many Black women of faith, spirituality and religiosity are much more than belief systems, but rather means of improving their overall well-being.

Considering implications of religious and spiritual practices on Black women's wellness, research shows that spirituality and religiosity are associated with Black women's ability to achieve desirable mental and physical health outcomes (Reed & Neville, 2014; Starks &

Hughey, 2003). In Starks and Hughey's (2003) multi-method study of the relationship between spirituality and life satisfaction for Black women at mid-life, the authors found that participants' spirituality was significantly associated with life satisfaction, while age, education, and income were not significant. These findings are surprising in that it is not unreasonable to assume stage of life, educational achievements, and financial resources would help predict one's life satisfaction. However, for the Black women in this study, spirituality is the only significant predictor of life satisfaction. Qualitative interviews with select participants revealed that spiritual-based mentoring from mothers and grandmothers especially taught them how to survive and succeed in an oppressive world for Black women. It was these lessons, combined with Black women's personal spiritual journeys to achieve meaning and wholeness in their lives, that allowed participants to achieve life satisfaction. Additional evidence of the relationship between spirituality and wellness comes from Reed and Neville's (2014) study investigating the potential mediating role of spirituality in explicating the relationship between religiosity and psychological well-being among Black women. Reed and Neville found that spirituality fully mediated the relationship between religiosity and mental health. Further, Reed and Neville's measure of spirituality attends to the importance of relationships and meaning-making in conceptualizing spirituality, which led the authors to conclude that, for Black women, relationships and the ways in which women make meaning of their life experiences can explicate the positive association between spirituality and mental health. Comparatively, Black women in Starks and Hughey's study found life satisfaction by seeking meaning in their lived experiences and relying on the spiritual wisdom gleaned from relationships with trusted mentors.

In line with studies concerning Black women's overall well-being, research has also demonstrated how Black women have used their spirituality and religiosity to cope with racism

and discrimination (Brodsky, 2000; Cooper, Thayer, and Waldstein, 2014). In Brodsky's exploration of the role of religion in the lives of 10 African American single-mothers, raising children in "risky, urban neighborhoods" (p. 199), the author found that participants' internalization of religious values allowed them to resist the deleterious effects of racism. Participants' religious values assured them that they were created just as God intended, which meant that their lives had purpose and they were worthy of respect. Mothers also reported instilling these values in their children to shield them from the harmful effects of racism. While Brodsky's research explored the psychological implications of spirituality and religiosity in Black women's responses to racism, Cooper, Thayer, and Waldstein's (2014) study investigated the physiological implications. Interested in the physiological effects of prayer as a means of coping with racism-related stress, Cooper and colleagues (2014) conducted a study examining 81 healthy, African American women's cardiovascular reactivity, post-stress recovery, and affective reactivity after being prompted to recall an experience of racial discrimination. Findings from the study suggest that utilizing prayer to cope with racism may have cardiovascular benefits for Black women. For women who reported using prayer as a behavioral response to exposure to racism more frequently, higher prayer coping was associated with decreased stress and blood pressure reactivity as participants recalled racist incidents, as well as decreased blood pressure and improved cardiac functioning as participants recovered from the racism recall activity. The researchers also noted that 49% of participants reported using prayer as a coping strategy for at least one type of racist incident, and prayer coping was most often used in response to racism encountered in participants' predominantly White academic settings. Though the authors do not elaborate on this particular finding, it is important to note that participants were all African American women undergraduates and graduate students attending a predominantly White

university. Cooper, Thayer, and Waldstein's study concurrently attends to the physiological implications of racism-related stress for Black women, as well as the protective properties of prayer for Black women of faith. Further, this study provides evidence that Black women may use their spirituality to contend with racial discrimination encountered in predominantly White academic environments.

Studies concerning Black women's uses of spirituality in their daily lives highlighted several ways that spiritual beliefs and practices influenced women's responses to adversity (Bacchus & Holley, 2004; Brodsky, 2000; Mattis, 2002). Bacchus and Holley (2004) identified five functions of spirituality as a resource for coping with work-related stress in their study of 10 professional Black women. Participants' interview responses indicated that spirituality operated as a protective factor, source of personal strength, resource for general guidance, resource for guidance in decision-making, and a resource for reappraising stressors (Bacchus & Holley, 2004). Similarly, Black single mothers in Brodsky's (2000) study spoke of the ways that religion offered values and beliefs, which once internalized helped guide their behavior and informed the lessons they shared with their children. The mothers also mentioned the feelings of protection and blessing that religion provided them, which gave them hope for safety and security as they raised children in dangerous neighborhoods. Taken together, these studies demonstrate that spirituality and religiosity offer Black women a compass to help direct their paths and provide comfort in the knowledge that they have a resource at their disposal to keep them safe as they navigate stressful situations.

Participants in Mattis' (2002) qualitative study examining the role of religion and spirituality in the meaning-making and coping experiences of 23 Black women, offered multiple ways in which Black women found meaning in adverse circumstances and used their insights to

inform their coping strategies. Black women in the study discussed how spirituality and religiosity helped them interrogate and accept reality; recognize the extent of their abilities and engage in spiritual surrender; confront and transcend limitations; identify and grapple with existential questions and life lessons; recognize their purpose and destiny; define their character and act within personally meaningful moral principles; achieve growth; and trust the viability of transcendent forms of knowledge and communication—dreams, visions, proverbs, and the like (Mattis, 2002). Much like Bacchus and Holley (2004) and Brodsky's (2000) work, Mattis' study reveals that Black women's reliance on spirituality and religiosity to make meaning of and cope with trying circumstances is a proactive, rather than passive approach. Black women in these studies recognize their faith as a valuable resource with utility and power. Therefore, in embracing their spirituality and religiosity in times of adversity, Black women are activating a critical resource to remain resilient.

As Masten (1994) suggests, in addition to describing a person's ability to overcome adversity, being resilient can also denote a person's ability to recover from trauma. Research has shown that for Black women of faith, spirituality and religiosity is integral in their ability to cope with and recover from trauma (Blakey, 2016; Fischer et al., 2016; Johnson, Williams, & Pickard, 2016). For example, all 26 African American women in Blakey's (2016) case study had histories of substance abuse and had experienced two or more traumatic or potentially traumatic events in their lives. Traumatic, or potentially traumatic events included, but were not limited to: childhood sexual abuse, rape, domestic violence, or witnessing potentially fatal acts of violence perpetrated against close family members of friends. Although participants were not formally asked about their spirituality in the study, all 26 women expressed that their relationship with God was instrumental in their healing and recovery process. Blakey's participants "believed God

was a benevolent being that saved their lives, kept them sane, made them feel alive, loved them unconditionally, and forgave them for any wrongdoing" (p. 52). Relatedly, the majority (91%) of the 101 African American women surveyed by Johnson, Williams, and Pickard (2016) reported experiencing an average of 4.47 terrible, frightening, or horrible experiences in their lifetime. In light of the hardships these women have endured, 80% of study participants reported praying daily, 73% received a great deal of comfort and security from religion, and 84% felt certain that God exists and plays an active role in their lives. These studies suggest that Black women's spirituality is intimately connected to their ability to withstand adverse circumstances and survive.

Though scholars have attended to the functions of spirituality in the lives of Black women, fewer have attended to the mechanisms by which Black women access the benefits of spirituality. Current literature suggests that prayer and spiritual fellowship with others are two means of accessing the benefits of spirituality (Bacchus & Holley, 2004; Banks-Wallace & Parks, 2004; Brodsky, 2000; Mattis, 2002). Bacchus and Holley (2004) noted that for Black professional women in their study, prayer and meditation were specific outcome-oriented practices that helped them manage work-related stress. By praying throughout a stressful day, Black women were able to transcend oppressive work environments and other negative experiences. Banks-Wallace and Parks (2004) similarly found that for Black women in their focus group study spending time in prayer strengthened their spirituality. Participants shared that during prayer time they were communing with God. Women in the study shared that it was during prayer time that they contemplated the meaning of their lives, released their personal burdens, and received spiritual healing. These prayers were not ritualistic, but informal and conversational where they discussed all aspects of life with God. In addition to prayer, Banks-

Wallace and Parks highlighted the importance of fellowshipping with loved ones as a way for Black women in their study to further develop spiritually. Participants valued spaces where they could come together, exchange stories, share wisdom, and engage in formal and informal worship activities. Whether with friends, relatives, or members of their faith communities, participants agreed that these relationships were essential in fostering their spiritual development.

What Bacchus and Holley (2004) and Banks-Wallace and Parks' (2004) research suggests is that Black women's understandings of spirituality are rooted in relationships, both with transcendent forces and other people. Through this intimacy of connection, which can be achieved through prayer and/or communion with others, Black women are able to access the power of their spirituality as a critical resource. Findings from Mattis' (2002) work provide additional support regarding the relational nature of Black women's conceptualizations of spirituality. Mattis (2002) writes,

> [Black] women's beliefs in the interconnectedness of people's lives and destinies, their use of intercessory prayer, and their reliance on God, ancestors and human others for guidance, support, protection, and knowledge suggested that even seemingly "private" acts of devotion have a relational foundation. (pp. 317-318)

Despite the empirical evidence of the positive outcomes of spirituality for Black women, spirituality may not be a beneficial resource for all Black women. As Van Hook (2016) suggests, individuals can have negative religious or spiritual coping strategies which may include believing that adverse or traumatic events in one's life are the result of a transcendent force's (e.g. God's) judgment, punishment, or abandonment. Such strategies may contribute to feelings of anger, guilt, lower-self esteem, and unworthiness of protection and love from God. While traumatic experiences may encourage some Black women to seek purpose, hope, and solace

through spirituality, for others it may be a source of additional pain, self-blame, and loathing. Therefore it is important to attend to not only the importance, but also the meaning of spirituality in Black women's lives to understand its positive or negative influence on their well-being.

Furthermore, for some Black women, overreliance on spirituality or religiosity may discourage them from seeking professional intervention for their health concerns. Woods-Giscombe, Robinson, Carthon, Devane-Johnson, and Cobie-Smith (2016) found alignment between characteristics of the superwoman schema (SWS) and Black women's spiritual beliefs, which contributed to their reluctance to seek mental health services to cope with stress. Developed as a conceptual framwork to explicate the relationship between stress and health disparities among African American women, SWS has five characteristics: "(1) perceived obligation to present an image of strength, (2) perceived obligation to suppress emotions, (3) resistance to being vulnerable or depending on others for help, (4) motivation to succeed despite limited resources, and (5) prioritization of caregiving over self-care" (Woods-Giscombe et al., 2016, p. 1128). In Woods-Giscombe and colleagues' focus group study with a total of 48 African American women, participants shared that they felt culturally obligated to rely on their spirituality rather than therapy to overcome stressful situations. However, it should be noted that participants religious affiliations were not documented in this study. Participants' faith in God through adversity was presumed to be a demonstration of their personal strength to others. Additionally, though women in the study frequently suppressed their emotions, participants discussed emotional expression as being culturally acceptable in faith communities. Participants also shared that they were more likely to seek the counsel of a pastor, or minister, instead of a professional mental healthcare provider. Though Black women in Woods-Giscombe et al.'s study had reservations about seeking mental health professionals to cope with stress, findings

suggest that Black women might be more inclined to seek professional help if providers incorporated more culturally relevant practices including the use of spirituality as a resource as appropriate.

It is also important to note that not all Black women identify as spiritual. For instance, Black women who have been ostracized from faith communities as a result of other social identities held (e.g. sexual orientation, gender expression), or raised in secular, non-religious households may readily reject spirituality as a resource. Although spirituality may contribute to positive health outcomes for many Black women, there are those that may attribute their ability to remain resilient against psychological and physiological threats to other resources or strategies. Yet, for Black women of faith, spirituality appears to be vitally important in Black women's ability to cope and recover from adverse, and even traumatic, circumstances.

Spirituality among Black Women Collegians

Scholarship focused on spirituality among Black women collegians demonstrates how Black women have used their spirituality to engage in resistance, spiritual sense-making, remain motivated to stay in college, and determine career paths (Cannon & Morton, 2015, Constantine et al., 2006, Donahoo, 2011; Patton & McClure, 2009; Watt, 2003). A particularly illustrative example of spirituality's role in supporting Black women's ability to engage in resistance is the personal narrative shared in Cannon and Morton's (2015) article. Taking an autobiographical narrative approach, the authors describe how Cannon relied on her spirituality to cope with and resist stereotypes about her intellectual inferiority throughout her education. As a child, the death of Cannon's mother prompted her entry into the foster care system and marked the beginning of an entire year that Cannon stopped communicating verbally. The early years of Cannon's schooling were spent in special education classes, and when she eventually graduated from high

school and enrolled in college, she dropped out in the first few weeks. Yet, Cannon returned to higher education years later and she credited her "God-consciousness" for her ability to endure the challenges she faced in the historically White institution she attended.

In defining God-consciousness as the indwelling of the spirit, Cannon and Morton (2015) are referring to the presence of the Holy Spirit in a person's life, which can "supernaturally empower [humans] to live lives of faith in God" (p. 149). From this definition, it is clear that Cannon and Morton subscribe to a Christian theology that refers to God's nature in three ways: God the Father, God the Son (i.e. Jesus Christ), and the God the Holy Spirit. Cannon also used her spirituality, or God-consciousness, to resist negative assumptions about Black women during her graduate school experience. Through faith, Cannon was reminded that she was not constrained by society's perceptions. Cannon's personal account demonstrates how her spirituality helped her resist racism and other threats to her identity.

Likewise, participants in Constantine et al.'s (2006) qualitative study regarding religion, spirituality, and career development among 12 Black students at a historically White institution (eight of the 12 were Black women) relied on their spirituality to provide strength in trying circumstances. In the words of one participant, "prayer gives me the courage and strength to keep on keeping on, especially when I feel like I'm at the end of my rope...Sometimes I can't do anything but pray to deal with all the crap I deal with [on this campus]..." (Constantine et al., 2006, p. 236). For Constantine et al.'s (2006) participant, prayer represented connection to a divine source of supernatural power believed to have influence over situations occurring in the natural realm. Prayer, or communication between a person and a transcendent force, appears to be a vital coping mechanism for Blacks and serves as an expression of spirituality (Constantine et al., 2006, Herndon, 2003; Lewis et al., 2007; Mattis, 2000; Patton & McClure, 2009; Riggins

et al., 2008; Shorter-Gooden, 2004). Scholarship concerning Black students' utilization of spirituality as a tool for resisting racism and coping with difficult circumstances reveals the moderating effects of spirituality on the deleterious effects of racial discrimination.

Findings from Watt's (2003) focus groups with 48 African American college women highlight how students used spirituality to learn more about themselves and cope with challenges. Participants in Watt's study also described adopting spiritual philosophies that helped them persevere through challenging situations, such as unexpected deaths of friends and loved ones. Similarly, participants in Patton and McClure's (2009) qualitative study on the role of spirituality in 14 African American college women's lives relied on spiritual philosophies, often drawn from religious texts, to overcome adversity. For example, students discussed how believing that God had a master plan for their lives allowed them to view challenges as stepping stones on their journeys to become the women they were destined to be. As Black women in Patton and McClure's study shared how spirituality gave them strength to deal with highly stressful or traumatic events, including rape, domestic violence, and caretaking responsibilities for family members, the authors concluded that "such situations were commensurate with establishing and maintaining spirituality to be resilient in college" (p. 47).
Broadly conceptualizing educational resilience to be academic achievement despite adversity, Patton and McClure's participants were without question resilient.

Spirituality also appears to contribute to Black women's educational resilience by providing them with a sense of purpose in the pursuit of higher education. Citing Bernard (1991), Wang et al. (1994) describe resilient children as having high expectations, a belief that their life has meaning, and goal direction. For Black women who are tapped into their spirituality, the

search for meaning and purpose in one's life is an integral component of their spiritual and academic journey.

In Donahoo's (2011) exploration of Black women's perspectives on spirituality, religion, and college life, one of her participants stated, "My spiritual life is most important and my academic/intellectual development accentuates my spiritual life, and I need knowledge to reach into areas where there is no hope, light, love, and faith" (p. 82). This student's comments suggest that in giving her spiritual development the utmost priority, her academic endeavors align with her spiritual purpose and lead her into spaces where she can share her spiritual beliefs with others.

Summarily, findings from qualitative research regarding Black collegiate women's spirituality also demonstrate that practices associated with spirituality are compatible with behaviors exhibited by resilient individuals. Self-understanding and a belief that one's life has meaning and purpose are qualities possessed by resilient individuals (Greene & Conrad, 2012; Wang et al., 1994) that can be complemented by one's spirituality. Spirituality encourages processes of self-knowledge acquisition, meaning making, and the pursuit of purpose, which also happen to foster resilience.

This review of research pertaining to Black women's spirituality clearly demonstrates a connection between spirituality and resilience for Black women of faith. However, Black women's understandings and uses of spirituality remain under-examined. Black women's spirituality defies dominant narratives concerning rationality and reason, but as these studies demonstrate, Black women's spiritual ways of knowing, seeing, and operating in the world affect their lives and well-being. This scholarship leads me to believe that for many Black women spirituality is a powerful force that imbues them with the strength to endure and overcome

unimaginably trying circumstances. If Black women can use their spirituality to promote their well-being, escape domestic violence, or discover their life's purpose, Black doctoral women in engineering may similarly use their spirituality to contend with the potentially marginalizing educational environments of STEM fields. It is important to note that the views expressed by participants in this study largely reflect their Christian backgrounds. Though the call for participants did not specify particular religious groups, or explicitly define spirituality, all 16 of the women in this study identified with Christianity to some extent.

Black Women in STEM

Scholarship pertaining to the experiences of Black women in STEM describes how these women grapple with unwelcoming and, at times, openly hostile educational environments. From K-12 to graduate education, Black women not only contend with the academic demands of their difficult disciplines, but also the intricate, intersecting webs of racial and gender oppression that attempt to stifle their progress. The obstacles that Black women encounter in STEM are well documented, yet it is critical to remember that in spite of such challenges, Black women have demonstrated remarkable resilience. In the section that follows, I will elaborate on the barriers Black women encounter in their educational trajectories in STEM as found in recent literature. I do so with an awareness that much of the research concerning Black women in STEM fields has focused on such barriers, but I propose that it is time to consider previously under-examined resources, such as spirituality, that Black women draw upon to remain resilient and flourish in these fields.

Pre-College Experiences

Despite young Black women's growing interest in STEM fields (Malcom & Malcom, 2011), many are systematically disenfranchised from STEM pathways during their K-12

education (Russell, 2005). Historically, Black youth in America were legally denied equal access to educational opportunities as a result of the enduring legacy of slavery. At the time, pervasive cultural beliefs concerning Black intellectual inferiority and scientific racism buttressed claims that Blacks were ill equipped to study and succeed in the hard sciences (Betchel, 1989); beliefs which still manifest today. As Russell (2005) asserts, many Black youth contemporarily contend with educators' low expectations, watered-down curriculums in minoritized, urban communities, and tracking processes that occur as early as elementary and middle school. Though there are certainly young Black women that are well prepared academically and receive support to succeed in STEM fields, there are several others whose ability to access the advanced courses and co-curricular opportunities necessary to propel them into STEM fields is inhibited. For young Black women who manage to rise above the institutionalized barriers to their STEM engagement and persistence in the K-12 education system, considerable obstacles await them at the postsecondary level.

Experiences in College

Research demonstrates that Black women often experience unwelcoming STEM cultures during college. Ong, Wright, Espinosa, and Orfield (2011) conducted a comprehensive literature review of nearly 40 years of scholarship to investigate the factors that contribute to underrepresented Women of Color's persistence and departure from STEM fields. Findings regarding the undergraduate experiences of Women of Color in STEM reveal that these students contend with interplay of multiple systems of oppression in their educational environment. Whereas White women might experience differential treatment from male counterparts in STEM as it relates to their gender identity, Women of Color report experiences of racial and gender discrimination, which are often intertwined. Further, the authors found that meritocratic STEM

cultures that emphasize academic performance and research production typically ignore the social realities of Women of Color, including their experiences of racism and sexism. Participants in Ceglie's (2011) study concerning the formation of science identities among Women of Color expressed feelings of marginalization in STEM academic environments where they were sorely underrepresented, stereotyped, and perceived as outsiders in fields predominately occupied by White males. Moreover, the scarcity of Women of Color teachers, faculty, and researchers skewed participants' perceptions of who represented science. Further, in Carlone and Johnson's (2007) ethnographic investigation of the experiences of Women of Color in relation to their science identity development, the authors found that participants who reported feeling discriminated against, underestimated, or simply neglected in the sciences by meaningful others were often women who were the most racially and ethnically different from the "norm" of science. Three of the four African American participants fell into this group. These women described being viewed by established members of their science communities as stigmatized group representatives, rather than credible scientists. Black women's experiences of marginalization in unwelcoming STEM cultures are further exacerbated in historically White institutions.

Reflecting on their undergraduate experiences, Black women mathematicians who reported attending historically White institutions in Borum and Walker's (2012) study shared experiences of covert and overt racial and gender discrimination. One participant described arriving on the first day of classes and noticing the faculty member's surprise to have a Black woman in his mathematics course, an incident that happened more than once with the same professor. Another Black woman recalled being advised by a faculty member in her department to switch majors, which she did, though later learned from other students that this professor was

notoriously sexist and desired the field of mathematics to remain male-dominated. Black undergraduate and graduate women majoring in physics who attended historically White institutions in Fries-Britt and Holmes' (2011) study shared experiences of isolation and discriminatory treatment from faculty and students. Participants described being made to feel inferior by men assuming that they were unknowledgeable of laboratory equipment and procedures. Black women also mentioned experiences of being given menial tasks from faculty members and classmates that underestimated their capability to perform more intellectually demanding tasks. Likewise, Black women majoring in engineering in Newman's (2011) study described poignant experiences of racial and gender discrimination from peers and faculty members in predominantly White academic environments. One Black woman expressed frustration about constantly being asked where she was from by White peers and faculty— implying that she must be an international student— because they could not imagine a domestic African American student excelling as she had in engineering. Scholarship concerning Black women's experiences in STEM graduate education reveals that Black women receive similar mistreatment at the graduate level as they do as undergraduates.

Experiences in Graduate School

Consistent with the literature concerning Black women's undergraduate experiences in STEM fields, Black graduate women in STEM endured racial and gender bias in their predominately White and male fields. In Charleston, George, Jackson, Berhanu, and Amechi's (2014) examination of Black women's experiences in the computing sciences, participants reported being the targets of stereotypes and misrepresentations of their intellectual abilities based on their identities as Black women. Participants disclosed experiences of cultural isolation and subordination to White peers through exclusion and presumptions of incompetence.

Comparably, African women in Beoku-Bett's (2004) study who earned graduate degrees in STEM at universities in the United States, Canada, and Europe shared experiences where they felt unsupported and intellectually disparaged as Black women. Participants' perceptions of racial and gender discrimination were compounded by the intersection of their ethnic and national identities, which contributed to what Beoku-Betts described as Third World Marginality. For African women, dominant narratives concerning the superiority of American and European scientific training and research production drove negative assumptions about Black African women's ability to meaningfully contribute to STEM intellectual communities. Collectively, Charleston et al. (2014) and Beoku-Bett's (2004) findings illustrate the contestation of Black women's presence in traditionally White and male-dominated STEM graduate programs.

Researchers have also documented the difficulty Black women have adjusting to the STEM climates at historically White institutions (Borum & Walker, 2012; Joseph, 2012). Joseph's (2012) exploration of African American women's transitions from Historically Black Colleges and Universities (HBCU's) to historically White institutions for graduate studies in chemistry and mathematics revealed that participants experienced culture shock upon arrival to their graduate programs. Black women described interactions with faculty members and students at historically White institutions as cold and distant, in contrast to their relationships with professors and peers at HBCU's which were friendlier and more familial. In addition, Black women felt culturally isolated at their graduate institutions where they described frequently being unable to relate to their White peers. Black women who ultimately earned doctorates in mathematics in Borum and Walker's (2012) study highlighted lack of faculty support and discrimination as deterrents in their pursuit of graduate degrees. Two Black women in the study

left their original institutions to pursue doctorates elsewhere as a result of discriminatory treatment experienced. One of these women referred to the harm done to her self-esteem as a result of being surrounded by White men whom she believed discounted her as a serious mathematician due her race, gender, and undergraduate training at a HBCU.

Summarily, Black women contend with a unique intersection of racial and gender discrimination throughout their educational trajectories in STEM. Critical race theorists suggest that racism pervades every institution in American society, including the educational system. Thus, it comes as no surprise that Black women grapple with the oppressive beliefs and practices that manifest in their pursuit of STEM degrees and careers.

For the purpose of this study, I focus specifically on Black women in engineering doctoral programs. Engineering presents a unique context to examine Black women's experiences, along with their spiritual epistemologies and ontologies because of the nature of the field and Black women's severe underrepresentation at the doctoral level. In 2016, Black women earned 1.5% of engineering doctorates by U.S. citizens and permanent residents as compared to 50.2% by White men. In the same year, 14.3% of engineering doctorates were earned by White women, 4.37% by Asian women, 1.7% by Hispanic or Latina women, and 0.07% by American Indian or Alaskan Native women. As a profession, engineering is known for the use of analytical thinking to provide practical, technical solutions to societal problems (National Academy of Engineering, 2004). However, in the U.S. where Black women's contributions to STEM have historically been obscured or erased entirely (see Shetterly, 2016), and the things Black women produce can be involuntarily and unjustly taken (see Skloot, 2010), examining Black women's spiritual ways of knowing in academic contexts where they may be invalidated as knowers is an opportunity to understand if and how their spiritual epistemologies relate to their engineering

identities. Additionally, Black women's underrepresentation in engineering could create potentially marginalizing environments to express their spiritual epistemologies and ontologies. Further, Black women's race and gender threatens the property value of Whiteness in traditionally White and male-dominated STEM fields, which could create unwelcoming and occasionally hostile environments for Black women. Yet, with every obstacle comes an opportunity to overcome, which many Black women in STEM have and will continue to do.

Though Black women continue to contend with formidable challenges in their pursuit of STEM degrees, there are those who persist and thrive. Black women's persistence in STEM fields has been studied in various ways. Scholars have examined Black women's experiences prior to college, such as their advanced course taking in math and science during K-12 (Russell, 2005), participation in pre-college STEM-enrichment activities (Borum & Walker, 2011; Ceglie, 2011, Ellington & Frederick, 2010; Hanson, 2004), support from family members (Borum & Walker, 2011; Ellington & Frederick, 2010; Russell & Atwater, 2005), and encouragement from K-12 teacher's in cultivating young Black women's interests in STEM (Russell & Atwater, 2005; Rice & Alfred, 2014). Further, at the college level, research has demonstrated that relationships fostered with supportive faculty members and mentors (Fries-Britt & Holmes, 2011; Joseph, 2012; Newman, 2011; Ong, Wright, Espinosa, & Orfield, 2011) along with the development of strong peer support networks (Lancaster & Xu, 2017; Rice & Alfred, 2014) are integral in promoting Black women's persistence in STEM fields. Further, several authors have noted the instrumental role of HBCUs in providing culturally affirmative experiences and strengthening Black women's STEM identities in their pursuit of STEM degrees (Borum & Walker, 2011; Borum & Walker, 2012; Brown, Morning, & Watkins, 2005; Fries-Britt & Holmes, 2011; Jackson, 2013; Joseph, 2012; Perna et al., 2009). Additionally, research regarding

the experiences of Black women in STEM graduate programs reveals that family support (Ong, Wright, Espinosa, & Orfield, 2011), peer networks (Charleston & Leon, 2016; Ong, Wright, Espinosa, & Orfield, 2011), and mentorship (Beoku-Betts, 2004; Borum & Walker, 2012; Dortch, 2015; McGee, 2016) are vital in supporting Black women's successful completion of STEM graduate degree programs. Collectively, these findings suggest that supportive relationships, formative STEM experiences, and welcoming climates all valuably contribute to Black women's ability to succeed in STEM.

Furthermore, Black women's intrinsic motivations and sheer will to surmount the obstacles placed before them cannot be underestimated as they strive to achieve their academic and professional aspirations in STEM fields. Ellington and Frederick (2010) investigated the experiences of high achieving Black undergraduates majoring in mathematics. The authors found that participants felt motivated by the support that they received from members of the Black community. More specifically, participants noted that members of their churches and spiritual community were valued sources of encouragement. Additionally, researchers have found that the desire to give back and serve as role models for their communities are strong driving forces for Black students in STEM (Charleston & Leon, 2016; Fries-Britt & Holmes, 2011; McGee et al., 2016). In McGee and colleagues' exploration of Black students' motivations to pursue doctorates in engineering, participants expressed being drawn to social justice paradigms that emphasized the importance of returning to and investing in one's community. Further, Black women physics majors in Fries-Britt and Holmes (2011) study shared that remaining in STEM was an opportunity for them to provide their communities with new role models and showcase that being a Black physicist was possible.

Black women have also employed various navigational strategies to remain persistent in STEM fields. Ko et al.'s (2014) examination of the strategies utilized by Women of Color in physics and astronomy to remain persistent in their fields, revealed that participants exercised their agency by circumventing unsupportive advisors, seeking out educational environments that promoted their success, developing strong peer networks to combat isolation, engaging in activism to improve the experiences of underrepresented students in STEM, and consciously demonstrating their intellectual capabilities to counteract disparager's doubts. The authors also found that Women of Color encouraged themselves by remembering their passions for science and finding places where their identities were fully embraced, such as professional societies for Students of Color, or through engagement in activities outside of STEM where they could pursue other passions and attend to their personal well-being. Black doctoral engineering students in McGee et al.'s (2016) study also mentioned striving to be overprepared for STEM courses and exams, as well as showcasing their academic achievements in order to combat stereotypes of Black intellectual inferiority. Relatedly, Shavers and Moore (2014) found that for Black women attending graduate school at a historically White institution the desire to prove people who doubted their abilities wrong and make their communities proud motivated them to persist academically, but also took a toll on their social, emotional, mental, and physical well-being. In taking such measures to remain persistent in STEM, participants in these various studies were demonstrating personal fortitude and an unwillingness to be deterred academically. Given the aforementioned barriers that Black women encounter in their STEM educational environments, Black women's use of these navigational strategies to stay committed to their pursuits, is an undeniable display of tenacity. Black women's ability to overcome adversity in their educational environments and excel academically is a form of resilience (Morales, 2008, 2014; Wang,

Haertel, & Walberg, 1994), which in turn contributes to their persistence in higher education. Considering the various barriers that many Black women must overcome throughout their STEM educational pursuits, I turn my attention to the culture of STEM itself and its contestation of Black women as possessors and contributors to knowledge.

Critical Perspectives on STEM Culture

As the literature pertaining to Black women in STEM fields suggests, Black women occupy a highly contested position in their fields. By virtue of their race and gender, Black women have historically and contemporarily been framed as antithetical to the prototypical image of the scientist, mathematician, or engineer as White and male. As such, Black women are often denied the privileges of their White male counterparts. In critical race theory, the concept of whiteness as property suggests that whiteness can be possessed, used, controlled, and enjoyed (Harris, 1993). Writing about the concept of whiteness as property from a legal perspective, Harris (1993) argues:

> Specifically, the law has accorded "holders" of whiteness the same privileges and benefits accorded holders of other types of property. The liberal view of property is that it includes the exclusive rights of possession, use, and disposition. Its attributes are the right to transfer or alienability, the right to use and enjoyment, and the right to exclude others. Even when examined against this limited view, whiteness conforms to the general contours of property. It may be a "bad" form of property, but it is property nonetheless. (p. 1731)

Applying this concept in STEM, inhabiting a White *male* body privileges its' occupant, because one's race and gender as property grant unquestioned access to the enterprise of science.

However, just as property can be bequeathed to another, I assert that whiteness can also be afforded to members of other racial and ethnic groups in the interest of maintaining dominance in the racial hierarchy. For instance, men of East (e.g. Chinese, Japanese) and South Asian (Indian) descent are well represented in STEM and receive similar privileges as their White male counterparts as a result of their being "raced" as White in the context of STEM. Yet, it is important to note that these men are not entirely exempt from discrimination on the basis of their race, ethnicity, nationality, religion and potentially other social identities. What I am suggesting is that in STEM fields, where such men are well-represented in the ranks of professionals, faculty, and students they may be honorarily, and perhaps temporarily, conferred the property value of whiteness in these environments. Thus, White men, and men of other races and ethnicities, who are granted the property value of white maleness, have the luxury of entering scientific communities with the presumption of credibility, albeit these presumptions can later be disproven. Black women, however, are not afforded such luxuries, and are often assumed unqualified until they prove otherwise – and perhaps even afterward.

According to Harris, the property value of whiteness is predicated on the devaluation of Blackness. Harris (1993) asserts, "owning white identity as property affirmed the self-identity and liberty of whites and, conversely, denied the self-identity and liberty of Blacks" (p. 1743). In the U.S., whiteness was both constructed and protected by law as a tool of racial subjugation. Metrics such as the "one drop" rule ensured that any person possessing one drop of Black blood in their ancestry was considered Black and denied the privileges of whiteness (Harris, 1993). However, such a rule was less helpful in defining who was White, but more so useful in determining who was Black and thus excluded from the material benefits of whiteness. Elaborating on the principle of exclusion in whiteness as property, Harris (1993) writes:

> The right to exclude was the central principle, too, of whiteness as identity, for mainly whiteness has been characterized, not by an inherent unifying characteristic, but by the exclusion of others deemed to be "not white." The possessors of whiteness were granted the legal right to exclude others from the privileges inhering in whiteness; whiteness became an exclusive club whose membership was closely and grudgingly guarded. (p. 1736)

The right to exclusion principle suggests that Black women are inherently precluded from the property value of whiteness as a result of their Blackness. In STEM fields, this may contribute to Black women being denied access to the same opportunities and resources as their White male peers, and those upon whom whiteness is conferred. Moreover, Black women's exclusion from whiteness may also contribute to the delegitimization of Black women's alternative ways of knowing in fields predominated by White men.

In her discussion of the origins of sociology as a science, Hill Collins (1998) describes how the valuation of positivist epistemologies in the field eventually led to the personification of "good" science as White maleness.

> In effect, what we have is a quantitative, abstract, objective macrosociology symbolizing the "hard" sciences—the male, the White, the Subject, the Universal—juxtaposed and defining itself in opposition to a qualitative, contextualized, interpretive microsociology referencing the "soft" sciences—the female, the Black, the Other, the Different…In brief, this perspective long equated the absence of Black women with excellence in the discipline and the presence of Black women with the seeming deterioration of the field. (p. 104)

Though Hill Collins was discussing sociology, her argument implicates the sciences, which supplied the positivist roots of the field as well as the norms and beliefs that sociologists mirrored historically in an attempt to earn recognition from the more established scientific disciplines[1] (Hill Collins, 1998). If White maleness is considered the standard of excellence in the "hard" sciences, then to be Black and/or a woman is to be the other.

In associating Blackness with laziness and intellectual inferiority (Mutegi, 2013), Blacks became disassociated with discipline and intellect, which were lauded by members of the scientific community as necessary qualifications for membership. Thereby systemically attempting to exclude Blacks from the scientific enterprise. Beliefs concerning the inferiority of Blacks have proliferated globally since the 16th century (Mutegi, 2013). Colonialism and the trans-Atlantic slave trade laid the foundation for the sociological construction of race that deemed Blacks as inferior others, ultimately contributing to their systemic disenfranchisement from the full rights and benefits of American citizenship (Mutegi, 2013). Furthermore, Mutegi argues that the societally pervasive myth of Blacks' inferiority inevitably shapes the educational experiences of Black students in science. If Blacks have societally been characterized as inferior, such perceptions would reasonably permeate institutionally (e.g. within education) and even departmentally (e.g. in science fields). This is clearly evidenced in American history when scientific racism served to support claims that Blacks were unfit to learn and succeed in the sciences (Betchel, 1989).[2]

[1] An exception to the more predominant positivist forms of inquiry in sociology is the interpretive approach of ethnomethodology. Ethnomethodology is a branch of sociology that focuses on "the study of 'situated actions' as 'publicly' interpreted linguistic forms" (Giddens, 1993, p. 43). In other words, ethnomethodologists seek to understand the social practices embedded in the day-to-day actions of ordinary people.

[2] Work such as *The Bell Curve: Intelligence and Class Structure in American Life* is an example of scientific racism.

Much like Blackness, womanhood was also subject to considerable contention in STEM, and engineering in particular. Writing about the origins of engineering as a field, Bix (2004) states, "women studying or working in engineering were popularly perceived as oddities at best, outcasts at worst, defying traditional gender norms" (p. 27). During the 19th century in the United States, engineers were rarely formally educated and typically become skilled through hands on experience (Bix, 2004). Work environments such as machine shops and railroad yards were often dangerous and quite physical which contributed to the field's domination by men. During World War II, manufacturing assembly lines in desperate need for more workers opened the door for women in engineering. As male troops returned at the conclusion of World War II, however, women were expected to return to their domestic roles, but women wanted to continue their technical training. Despite prevailing cultural beliefs and norms that attempted to dissuade women from pursuing technical careers in the interest of marriage and child-rearing, many women resisted these dominant narratives, resulting in several decades of organizing and intervention work to promote women's equitable inclusion in engineering (Bix, 2004). The concern about women's participation in engineering programs and fields continues today (Blickenstaff, 2005; Malcom & Malcom, 2011).

Furthermore, the ways in which Black women see, understand, and operate in the world may be unacknowledged and invalidated in STEM fields. Kelly, McDonald and Wickman (2012) suggest, "through interaction with the world and each other, members of communities come to define what counts as knowledge, evidence, explanation, and so forth, and embody an epistemology through such actions" (p. 288). In scientific communities predominantly comprised of White men, Black women's epistemologies may be lost in the broader discourse of the discipline. Hill Collins (2000) asserts, "Because elite White men control Western structures of

knowledge validation, their interests pervade the themes, paradigms, and epistemologies of traditional scholarship" (p. 251). Relatedly, Harding (2006) discusses how the epistemologies of science are implicated in imperialist and colonial projects, which privileges individuals of European descent and marginalizes people of Color. Harding (2006) writes,

> The sciences and philosophies of science of peoples of European descent are presumed to be purified of the religious and cultural features of their societies, whereas those of peoples of color are considered impure, permeated through and through by their religious and cultural features. The very standards for objectivity, rationality, and good method have been constituted in terms of their distance from qualities and practices associated with "primitives." Peoples of European descent are presumed to be capable of dispassionate objectivity, rationality, and higher mental achievements. "Primitives" are claimed to be ruled by their passions and bodily needs; they tend toward subjectivity and irrationality and are incapable of higher mental achievements. (pp. 29-30)

As history documents the obstacles that Blacks and women have encountered in STEM, Black women have and continue to endure the unique intersections of oppression as a result of their race and gender.

According to Omolade (1994), a self-described "griot historian and sociologist" (p. ix), Black women's spiritual epistemologies do not disappear as they engage in science. Omolade asserts that rather than attempting to deny Black women's spiritual ways of knowing, these spiritual epistemologies deserve recognition in science.

Omolade (1994) explains,

> Social scientists in their search for reasons, theories, themes, and explanations of human history have always dismissed the concept of inner spiritual life as a force in a material

> world, though any truly scientific understanding would have to acknowledge it. Resurrecting those prayers and dreams is the most difficult wrestling Black women scholars have to do…though it is all too necessary for any sensible understanding of the world and Black women's place within it. (p. 112)

When Omolade speaks of Black women needing to resurrect their prayers in dreams in their scholarship, she is suggesting that Black women may have been taught, perhaps through their training or dominant narratives pervading their disciplines, that the spiritual does not belong in science. However, to actually understand the world from a Black woman of faith's perspective, attending to their spiritual epistemologies is a necessity.

Black doctoral women's integration of the spiritual and scientific in engineering introduces the notion of calling toward one's work. Black women for whom science is spiritual may align their professional identities with their sense of purpose broadly, which in turn may encourage their resilience in engineering. In the section that follows, I will describe the conceptual framework guiding this study, which centers the spiritual epistemologies and ontologies of Black women enrolled in engineering doctoral programs.

Conceptual Framework

In this conceptual framework, I weave together elements of Black feminist thought, endarkened feminist epistemology, critical race theory, along with theology and religious studies scholarship from an African and African American perspective. I draw upon these various sources to explicate my epistemological, ontological, and, in the next chapter, methodological approach to this study.

Referencing Harding (1987), Hill Collins (2000) defines epistemology as an "overarching theory of knowledge" (p. 252), which is influenced by the politics of power that determine who

is believed and why. In this study, Black feminist thought (Hill Collins, 2000) and endarkened feminist epistemology (Dillard, 2006) guide my understanding and exploration of Black women's epistemological standpoints, which stand in contrast to White, Western epistemologies that often dismiss, or attempt to delegitimize Black women's ways of knowing. I look toward the scholarship of African religion scholar and Black critical theologian, Reverend Dr. John S. Mbiti and Reverend Dr. Carlyle Fielding Stewart, III, respectively, to inform my conceptualization of Black women's spiritual ontologies. Ontology refers to a person's ways of seeing and being in the world (Shajahan, 2010), and in this study I am especially interested in how Black women's resilience, resistance, and transcendence in their engineering doctoral programs are influenced by their ontological perspectives. Finally, I ground my discussion of engineering context in critical race theory as a means of acknowledging the enduring legacies of oppression that Black women continue to contend with in these spaces.

Within this conceptual framework, the engineering context represents the culture and history of engineering more broadly, as well as within the institutions and departments in which Black women are situated. Applying the critical race theory concept of the persistence of racism to the engineering context, I contend that the historical legacies of racism within engineering continue to pervade the discipline today. I also suspect that even in Minority Serving Institutions, such as Historically Black Colleges and Universities (HBCUs), the shadow of racism is still cast upon engineering as a discipline and those within it.

Additionally, critical race theory suggests that whiteness functions similarly to property in that it can be possessed, exercised, and controlled. I assert that in engineering, Black women are excluded from the property value of whiteness by virtue of their race and gender. In engineering, the prototypical engineer is white and male. Therefore, in addition to whiteness,

maleness has been wielded in the accumulation and reproduction of power in engineering. Thus, to be both White and male privileges one with credibility as a legitimate contributor to engineering, prior to being proven as such.

Moreover, as history suggests, the boundaries of white identity are more fluid than fixed in the interest of maintaining racial dominance. Thus, I propose that the property value of whiteness may be conferred upon non-Black, People of Color to some extent if they are believed to effectively perform "whiteness". I argue the performance of whiteness in engineering may be the adoption of prevalent epistemologies in the field (e.g., positivism, meritocracy, depoliticization) along with the achievement of success as measured by awards, recognitions, and demonstrating a high-level of skill in completing engineering tasks (e.g., math and science application, problem solving, making things). I assert that though Black women may also adopt scientific epistemologies and exhibit engineering prowess, they are precluded from the conferral of whiteness because of their Blackness. As Wiley suggests, assimilationism, or "Black adoption of White cultural traits and/or ideals" (p. 3) is based on the notion of Black cultural or behavioral inferiority. Therefore, even if Black women engineers perform whiteness to some degree, the perception of inferiority remains, resultingly excluding Black women from partaking in the property value of whiteness.

Due to their race and gender, Black women have been systemically disenfranchised from the scientific enterprise. Further, the epistemological and ontological perspectives of Black women have been minimized as they appear antithetical to dominant characterizations of science. In addition, Black women's spiritual epistemologies and ontologies may be in tension with prevalent epistemologies in engineering, which could prove to be challenging for Black women to reconcile. However, I suggest that for Black women of faith, their spiritual

epistemologies and ontologies in conjunction with support from their communities can help Black women withstand and overcome the oppressive forces operating in their educational environments.

Black women's communities of support may help buffer the deleterious effects of discrimination from the engineering context by providing Black women with encouragement and support during difficult times. For example, community members may remind Black women of their purpose in pursuing their doctorates in engineering, or counter the discriminatory messages Black women may receive from their educational environments. The desire to make their communities proud may inadvertently take a toll on the overall well-being of some Black women, however, by exacerbating the pressure they feel to succeed.

Tensions might also arise when Black women's personal spiritual epistemologies and ontologies do not align with views held by valued members of their communities. For instance, a Black woman who considers herself to be spiritual may outright reject organized religion, which could be a point of contention for certain members of her community.

Black doctoral women's communities of support may also help affirm, reinforce, and potentially foster their spirituality. For instance, during fellowship, prayer with others, and perhaps communal worship, Black women's spirituality may be fortified though their relationships with other people. I imagine there may be other ways in which Black women strengthen their spirituality in communion with others, such as through dance or song, as well as other means that have yet to be explored.

Finally, in this conceptual framework, I suggest that Black women's spiritual epistemologies and ontologies along with support from their communities contributes to Black women's ability to resist discrimination, transcend oppression, and remain resilient in their

engineering environments. For instance, believing that transcendent forces exist and have governing power in one's daily affairs may imbue Black women with a sense of strength that compels resistance to oppression. Further, their connections with transcendent forces may inspire their ability to transcend their oppressive educational environments, perhaps through prayer, meditation, or worship. Additionally, for Black women who believe that pursuing their doctorate in engineering is aligned with their life's purpose, they may be encouraged to remain resilient in their degree pursuit.

CHAPTER 3

Methodology and Methods

In this chapter, I discuss my study methodology and the ways that portraiture, critical race theory, Black feminist thought, and endarkened feminist epistemology inform it. As outlined in Chapter 1, through this study, I aim to answer the following research questions: What role does spirituality play in the lives of Black women in engineering doctoral programs?

1) How do Black women in engineering doctoral programs understand, describe, and express their spirituality? When, where, and with whom do Black women in engineering express their spirituality?
2) To what extent, and in what ways, does spirituality inform resilience, resistance, and transcendence among Black women pursuing engineering doctorates?
    a) How do Black women in engineering doctoral programs describe their experience in their educational environment, and how does spirituality help them to navigate the challenges and assets of that context?
    b) How are race and/or gender implicated in the challenges and successes that Black women in engineering experience, and how does spirituality help them to navigate those particular challenges?
3) How, if at all, is spirituality implicated in Black women's work as engineers (e.g., in

their knowledge claims, in the ways that they understand what is valid, in the creative process, in problem-solving, and in engaging others in collaborative processes)? To what extent do Black women in engineering experience conflicts between spiritual and scientific epistemologies?

I focus specifically on the experiences of Black doctoral women in engineering because these women's very bodies are subject to contestation in their fields because they are not White and male. As Black women in a predominantly White and male discipline, they may be subject to being devalued, overlooked, and even treated with overt forms of discrimination. Through this study, I intend to disrupt the property value of Whiteness *and maleness* in engineering by highlighting Black women's epistemological and ontological assets. I also specify Black women pursuing their doctorates in engineering because I presume that such students have already demonstrated a considerable amount of resilience to persist to the doctoral level and I imagine at this particular stage of life and academic career, my participants may have more experiences to draw from concerning their educational pathways and spiritual development.

Harkening back to the tenets of critical race theory, this study is driven by my commitment to social justice and the critique of liberalism. In centering the experiences of Black doctoral women in engineering and highlighting their spiritual epistemologies and ontologies, I hope to further legitimize Black women's spiritual ways of knowing, seeing, and being in this world, particularly in engineering environments where Black women are often discredited as agents of knowledge. Secondly, through this work, I aim to foreground the importance of creating more equitable and affirming educational environments for these women to be who they are fully and authentically. Yet, as the critique of liberalism suggests, such spaces will not create themselves. By investigating the role of spirituality in the lives of Black women in engineering doctoral

programs, I hope to encourage institutions to consider institutional interventions that improve the culture and climates of engineering programs so they are more welcoming for Black women.

Methodology

For the purpose of this study, I utilized portraiture (Lawrence-Lightfoot & Davis, 1997) as a qualitative method in examining the role of spirituality in the lives of Black doctoral women in engineering. In the mid-1990s, as qualitative methods were gaining acceptance in the educational research community, Lawrence-Lightfoot and Davis (1997) defined a portraiture as a method consistent with the phenomenological paradigm and borrowing its methods from the tradition of ethnography. The authors noted, however, that portraiture:

> pushes against the constraints of those traditions and practices in its explicit effort to combine empirical and aesthetic description, in its focus on the convergence of narrative and analysis, in its goal of speaking to broader audiences beyond the academy (thus linking inquiry to public discourse and social transformation), in its standard of authenticity rather than reliability and validity (the traditional standards of quantitative and qualitative inquiry), and in its explicit recognition of the use of the self as the primary research instrument for documenting and interpreting the perspectives and experiences of the people and the cultures being studied. (p. 14)

This method was particularly useful and appropriate for this study as I sought to foreground the narratives, epistemologies, and ontologies of my participants, while presenting my findings in a way that would be accessible to and resonate with audiences inside and outside the academy. Further, portraiture's standard of authenticity and focus on the self as the primary instrument of research, encouraged me to consider not only my interpretations of the findings, but also my presentation of them. As a spoken word artist, I found spoken word to be an effective medium to

synthesize and represent the findings of my research in a way that felt authentic to me and that reflected my positionality as the researcher. Rooted in a longstanding cultural tradition of oral storytelling, spoken word poetry allowed me to simultaneously capture the complexity and richness of my participants' narratives while conveying the depth of emotion laden in those narratives through the performance. I encourage readers of this dissertation to speak the poems aloud, using your voice to breathe life into the prose. Further, the use of "I" and "me" in the poems is an invitation to imagine yourself as the narrator, allowing you to connect more deeply with participants' experiences and perhaps finding resonance between theirs and your own. Lawrence-Lightfoot and Davis (1997) also suggest that "with portraiture, the person of the researcher—even when vigorously controlled is more evident and more visible than in any other research form" (p. 13). Thus, my use of spoken word in this dissertation allowed me to use the skills and means of communicating that I have to assert my voice as a social scientist and poet, while reaching diverse audiences and maintaining the integrity of my findings.

In portraiture, researchers combine "systematic, empirical description with aesthetic expression, blending art and science, humanistic sensibilities and scientific rigor" (Lawrence-Lightfoot & Davis, 1997, p.3). Accordingly, I systematically analyzed my interview data through detailed coding, writing impressionistic records (i.e., memos), and identifying key themes. I also used spoken word poetry as a means of illustrating my findings creatively. Each chapter of findings brings the narratives within it into creative communion; beginning with a narrative portrait of a participant to lay the groundwork for the findings, then introducing examples from other participants' stories to elaborate upon them, and concluding with a poem to further illustrate key themes and provide a collective portrait of participant experiences in relation to the research question addressed.

In this study, I also adhered to the five key elements of portraiture: context, voice, relationship, emergent themes, and the aesthetic whole, which describe in brief here, but also discuss further in the section on data collection. Portraiture refers to the research setting, or the context, as "a dynamic framework—changing and evolving, shaping and being shaped by the actors" (Lawrence-Lightfoot & Davis, 1997, p. 59). For this study, I was attentive to the contexts of participants' doctoral program environments as well as the spaces in which participants felt that they could openly express their spirituality, or be their most authentic selves.

Voice, in portraiture, describes "stance and perspective, revealing the place from which the portraitist observes and records the action, reflecting the angle of vision, allowing her to perceive patterns and see the strange in the familiar" (Lawrence-Lightfoot & Davis, 1997, p. 105). In crafting the portrait, the portraitist's voice is interpretative (seeking meaning), attentive to autobiography (the researcher's history, background, experience, culture), preoccupations (intellectual interests, disciplinary background, and conceptual frameworks), and dialogue (discerning the sound and meaning of actors' voices) (Lawrence-Lightfoot & Davis, 1997). In this study, I reflected on my personal and professional experiences studying engineering as a Black undergraduate as I listened to the stories of participants and continually referred to the conceptual frameworks guiding my preoccupations. Attending to voice also involved balancing my own interpretive voice as the portraitist with those of my participants, ensuring that I did not overshadow their narratives with my perspectives, but rather artfully co-constructed an authentic rendering of my participants' experiences with them.

Building relationships with participants is central in portraiture. According to Lawrence-Lightfoot and Davis (1997), "it is through relationships between the portraitist and the actors that access is sought and given, connections made, contracts of reciprocity and responsibility (both

formal and informal) developed, trust built, intimacy negotiated, data collected, and knowledge constructed" (p.135). Cultivating relationships with my participants entailed building trust, modeling vulnerability, and attempting to represent my participants' narratives honestly. During the data collection period, I built rapport with women in the study by demonstrating a genuine interest in who they are as people, which involved attending events when they invited me, following up with them regarding their well-being when they shared difficult memories or recent experiences, and demonstrating compassion and care during emotional moments in the interviews. Further, the relationships I fostered with my participants were strengthened through our dialogue with one another. Lawrence-Lightfoot's (1997) notes a similar experience in her discussion of the connections she fostered with her participants, "not only was the depth of these relationships defined by the duration and rhythm of the time we spent together, it was also shaped by the intensity of the discourse" (p. 138). This relates to Hill Collins's (2000) assertion of the importance of dialogue in assessing knowledge claims among Black women, "a primary epistemological assumption underlying the use of dialogue in assessing knowledge claims is that connectedness rather than separation is an essential component of the knowledge validation process" (p. 260). Dialogue ties strongly to notions of communalism prevalent in African and African American societies. Ideas are examined and proven through conversation with others as opposed to independently. Through dialogue Black women are able to share their lived experiences, which for most Black women, confers credibility and believability to someone positioning herself as an expert on a particular topic (Hill Collins, 2000). Therefore, lived experience frequently becomes a criterion for credibility among Black American women as knowledge claims are made (Hill Collins, 2000).

Portraitists also uncover themes in the data using five modes of analysis: by listening and looking for repetition in participants' speech and actions, resonant metaphors that reflect an experience or meaning shared by multiple participants, rituals which symbolize what participants or an institution value, as well as triangulating points of convergence in the data and searching for patterns (Lawrence-Lightfoot & Davis, 1997).

> The portraitist draws out the refrains and patterns and creates a thematic framework for the construction of the narrative. She gathers, organizes, and scrutinizes the data, searching for convergent threads, illuminating metaphors, and overarching symbols, and often constructing a coherence out of themes that the actors might experience as unrelated or incoherent. This is a disciplined, empirical process—of description, interpretation, analysis, and synthesis—and an aesthetic process of narrative development. (Lawrence-Lightfoot & Davis, 1997, p. 185)

In my analysis, I was attentive to instances of repetition, metaphors, rituals, and patterns across participants' narratives. This not only helped me discover themes in the data across participants, but also allowed me to craft spoken word poems that creatively illustrated those themes.

Whereas emergent themes were the threads that tied the portrait together, achieving an aesthetically whole narrative in portraiture involved attending to conception, structure, form, and coherence. Conception refers to the "total gestalt-like grasp of the story that enables the author to control the development of a situation, the characters, theme, plot, style, and technique, so that in the end they cohere, as in a single charged image" (Lawrence-Lightfoot & Davis, 1997, p. 248). A slight departure from Lawrence-Lightfoot and Davis' focus on a single portrait, my dissertation is comprised of a set of portraits—both in narrative and poetry form—that reflect the experiences of my participants in relation to my research questions. Structure provides the frame,

stability, and organization of the narrative (e.g., subheadings, metaphors that are threaded throughout the piece) which scaffold the narrative. Form offers intellect, emotion, and aesthetics which breathe life into the structural elements of the portrait. According to Lightfoot and Davis (1997), "[form] expressed in stories, examples, illustrations, illusions, and ironies—[give] life and movement to the narrative, providing complexity, subtlety, and nuance to the text, and offering the reader opportunities for feeling identified and drawn into the piece" (p. 254). Further, coherence refers to the "orderly, logical, and aesthetically consistent relation of parts, when all the pieces fall into place and we can see the pattern clearly" (p. 255). In other words, coherence is the unity and integrity of the portrait as a whole. While my analysis allowed me to conceive and scaffold the narrative of the study, the poetry provided form and coherence regarding participants' collective experiences. On achieving an aesthetically whole narrative—Lawrence Lightfoot and Davis (1997) liken the crafting of written portraits to visual art, "as in the construction of a work of visual art, the significance of the details of presentation transport the portrayal beyond simple representation into the realm of expression" (p. 28).

Another key element to portraiture is the search for goodness in participants or institutions that the portraitist is studying. Lawrence-Lightfoot and Davis (1997) note that in searching for goodness the researcher does not attempt to idealize the actors within the portrait, but rather adopts an approach to inquiry, analysis, and reporting of findings that depicts actors' strengths with authenticity, integrity, and honesty which leaves room for a discussion of weaknesses that is not pathologizing or deficit-based. Lawrence-Lightfoot and Davis (1997) describe the portraitist's search for goodness in the following manner:

> The portraitist's stance is one of acceptance and discernment, generosity and challenge, encouraging the actors in the expression of their strengths, competencies, and insights.

> She sees the actors as knowledge bearers, as rich resources, as the best authorities on their own experience. She is interested in examining the roots of their knowledge, the character and quality of their experiences, and the range of their perspectives. In supporting the expression of their strengths, the portraitist also seeks to create a dialogue that allows for the expression of vulnerability, weakness, prejudice, and anxiety—characteristics possessed in some extent by all human beings, and qualities best expressed in counterpoint with the actors' strengths. (p. 141)

Portraiture's intentional pursuit of goodness aligned with my approach to this study in that I sought to foster relationships with my participants that permitted me to see their strengths as possessors and creators of knowledge, while also giving them the space and opportunity to be vulnerable when expressing areas of insecurity in their spiritual and academic lives.

Throughout the research process, my participants and I worked together to craft thoughtful renderings of their academic and spiritual experiences. Portraiture offers a means of understanding Black women's spiritual epistemologies and ontologies in relation to their lived experiences as engineering doctoral students, as well as the stories of how they came to be spiritual people and engineers. As Dillard asserts (2000), "what happens in everyday life to individuals within the community is critical to 'making sense' of particular actions, expressions, experiences and community life in general" (p. 675). Finally, because a person's spiritual epistemologies and ontologies are not readily observable, the emphasis in portraiture on relationship building and dialogue between the researcher and participants offer a research method that could illuminate the typically unseen experiences in participants' lives.

Method

Study Site

My research sites were a large, public, historically White institution and two historically Black institutions. These particular institutions were selected based on their engineering doctoral program offerings and their enrollment of Black women in such programs. The engineering departments at all three institutions had domestic and international students, as well as students of various racial and ethnic backgrounds. Additionally, within their respective engineering departments (e.g., chemical, industrial, mechanical), participants were still one of few or the only Black women in their fields at both the historically White and Black institutions. Also, much like the engineering faculty at the historically White institution, the historically Black institution faculty were comprised of professors of various races and ethnicities.

I conducted my study at a historically White university with a history of exclusion and marginalization of Black students, rather than an institution where Whites are simply in the numerical majority, because critical race theory would suggest that such an institution is still grappling with the residual effects of racist policies and practices that permeate the educational experiences of Black students today. I aimed to examine how racism persists in this particular institution, and particularly in its engineering school to understand how this environment potentially acts as a form of adversity from the perspectives of Black doctoral women striving to be educationally resilient in engineering. I also conducted research at two historically Black institutions to understand the role of spirituality in Black doctoral women's lives in a different engineering educational context. Further, I desired to explore whether or not Black women in historically Black institutions experience racialized and gendered discrimination in the discipline of engineering despite being situated in a historically Black academic environment. Given that

engineering as a discipline is still predominantly White and male, and rooted in legacies of exclusion and discrimination towards women, Black people, and Black women, I was curious if such histories still pervade the educational experiences of Black women pursuing engineering doctorates at historically Black institutions.

Participants

A total of 17 self-identified Black women of various ethnicities (i.e., American, Brazilian, Cameroonian, Ghanaian, Kenyan, Nigerian, and Panamanian) pursuing doctorates in engineering participated in the study. Engineering majors represented in the study were as follows: biomedical, chemical, civil, computer science, electrical, environmental, industrial, materials science, mechanical, and nuclear. Eight of the 17 participants attended historically Black institutions and nine attended historically White institutions. Participants ranged from first year pre-candidates to seventh year candidates in their programs at the time of the first interview. Additionally, participants ranged from 22 to 48 years of age. Sixteen participants completed all aspects of the study (i.e., three full interviews, journaling, and photo elicitation); one participant completed only the first interview. For the purpose of this dissertation, only data from the 16 participants who completed all aspects of the study were included. All 16 remaining participants identified with Christianity to some extent with specific denominations represented including: African Methodist Episcopal Zion, Apostolic Pentecostal, Baptist, Catholic, Hebrew Israelite, Lutheran, Protestant, and nondenominational. I obtained Institutional Review Board approval to conduct research with human subjects and received consent forms from all 16 participants included in the study.

To recruit participants, I approached local chapters of various organizations with memberships that include Black women in engineering doctoral programs such as the National

Society of Black Engineers and Society of Women Engineers (Appendix A). I also contacted faculty members and engineering department administrators at the selected institutions to disseminate my call for participants to their student listservs. Additionally, I requested that participants extend the invitation to other women at their institutions who met the study criteria.

Data Collection Strategies

I conducted three semi-structured interviews with Black women in doctoral engineering programs over the course of six months between January 2019 and June 2019. Photo elicitations and journals were strategies for learning more about my participants and shaping subsequent interviews with them. In the third interview, participants and I revisited content from their previous interviews and I asked clarifying questions for member checking purposes.

In this study, I consider the conversations that my participants and I had during the interviews and member checking process as dialogue. Though my protocols certainly served as guides during my interviews with participants, I adopted a more conversational interview style, where my participants and I were engaged in an exchange of stories and experiences rather than a strict adherence to the question and answer format. This approach gave my participants the freedom to help direct our conversation as it supported the authentic telling of their own stories. My use of portraiture strongly aligns with Black feminist epistemology's emphasis on the importance of lived experience and dialogue in making and assessing knowledge claims. Through our conversations, I hoped to learn more about my participants' understandings of spirituality and how it operates in their lives. In a later section on ethical considerations, I discuss the ontological implications of my research approach more in depth. Specifically, I highlight the ways in which Black feminist thought and endarkened feminist epistemology inform my work.

In addition to the applications of endarkened feminist epistemology to my approach as a researcher, I also used it to guide the interview questions asked of participants. As previously discussed, endarkened feminist epistemology's methodology of surrender attends to the importance of love, compassion, reciprocity, and ritual in one's research. Thus, during the first interview (Appendix B), I asked participants how they took up these principles in their work and scholarship in engineering. For example, to discover what participants loved about their work in engineering, I asked participants' what they valued about their engineering studies. Regarding compassion and reciprocity, I asked participants what motivated them to pursue their doctorates in engineering, as well as how their studies aligned with their personal values, which gave them an opportunity to discuss how their work potentially allowed them to help others and perhaps give back to their communities. Finally, concerning ritual, I wanted to understand how participants' engineering work might be an intellectual *and* spiritual pursuit. For instance, I asked participants if they had an overarching sense of purpose in their lives and how their work in engineering related to that sense of purpose. Additionally, the first interview also included questions that intended to capture participants' understandings of spirituality and where those understandings originated. For example, "What does being a spiritual person mean to you? What are ways that you express your spirituality? Who influenced your understanding of spirituality (e.g. family, friends, faith-based community)?" Additionally, I used this interview to help illuminate possible connections between participants' educational pursuits and their spirituality. For instance, "Please describe a time when you were experiencing a difficult period in engineering, how did your spirituality help you?"

In the second interview (see Appendix D), I learned more about participants' spirituality in the context of their engineering programs. I was primarily interested in how, when, where, and

with whom participants felt comfortable expressing their spirituality in engineering contexts. To seed this interview, I asked participants to engage in photo elicitation and writing journals (Appendix C) in which they documented critical spaces where their spirituality and/or educational resilience may be operating in their pursuit of engineering doctorates. Researchers incorporate participant-generated visuals in studies to deepen participants' reflections and engagement in the research process (Branch & Latz, 2018). According to Denton, Kortegast, and Miller (2018), "the use of visual images in higher education research and practice can allow participants to illuminate their life experiences as well as otherwise taken-for-granted or invisible aspects of their institutions" (p. 24). Specifically, I drew upon the method of photo elicitation, which "utilizes photographs to explore meanings individuals attach to particular topics" (Denton et al., 2018, p. 18). The photos and journal entries were used for the express purpose of deepening participants' reflections and meaning making regarding the contexts they occupy and enriching our conversation during the second interviews. Although the photos and journals provided were not analyzed for the purpose of this project, participants' engagement in these activities were a pivotal part of the study both for their meaning making and my own as I wrote impressionistic records documenting my early interpretations, analyses, and findings. In portraiture, requesting and viewing relevant documents is customary as they can become informative resources during the study; additionally, "by sharing an open interest in viewing such materials, portraitists invite the actors into the portraiture process" (Lawrence-Lightfoot & Davis, 1997, p. 63).

Participants were informed of the photo elicitation and journal prompts (outlined in Appendix C) at the time of recruitment for the study and at the end of the first interview, and were given opportunity to ask any questions that they might have had about the photo elicitation

and journaling process. After the first interview, I sent participants a series of prompts and requested that they take—or provide existing photographs—of spaces they frequented in their engineering schools and departments, where they felt the most and the least spiritual on and off campus, and personal photos they believed captured their most authentic selves. I also asked participants to draw timelines of when they worked through a difficult problem or situation while in their doctoral programs, and where spirituality informed the steps before, during, or after. In addition to providing the photos and timelines, participants were asked to write journal entries in which they described where the photos were taken and reflected on their choice to photograph these particular spaces.

Participants were allowed to complete and submit their photos and journals in any order they chose; however, all submissions needed to be completed by the appointed time prior to the second interview to give me adequate time to review their responses in preparation for our next conversation. After reviewing the photos and journal entries prior to the second interview, I developed a set of guiding questions for each participant. During the second interview I re-introduced the photos the participants took, along with content from their journals, to further explore where, when, and with whom they felt most comfortable expressing their spirituality.

I did not formally analyze participants' photos and journal entries; rather they were study tools that assisted in the co-construction of the narrative portraits that provided further context regarding participants' spiritual and academic environments. Importantly, I chose not to include the photos in this study because pictures taken on campuses could be readily identifiable, or were of participants' themselves, and both could compromise confidentiality. I interspersed information that participants shared in their journal entries throughout my second interview with each participant, pulling specific excerpts from the journals and explicitly asking participants

about their entries in those conversations. This allowed participants to expound upon their journals during their in-person interview which helped provide additional clarity on writings pertinent to the research questions guiding the study.

The third interview was used for the purposes of member checking and elaboration of key experiences or comments made in the prior interviews by participants (Appendix E). During the third interview, I shared quotes from previous interviews with participants to see how their thoughts and opinions might have changed since starting the study. For example, I read to participants their early definitions of spirituality expressed in the first and second interviews, and asked if and how those definitions might have evolved over time. I also used this time to ask participants any clarifying questions that I had about their experiences, or comments they made in previous interviews. In addition, I asked participants to share their thoughts on how their spirituality did, or did not align with the nature and beliefs of their disciplines in engineering. This question was appropriate for the final interview because it allowed participants to build upon the conversations that we had thus far as they articulated how their spiritual epistemologies and ontologies potentially aligned, or did not align, with those of their scientific communities. Finally, I asked participants to share how participating in the study may have influenced them. This third interview was pivotal regarding my methodological approach in that it allowed me to re-engage my participants as co-constructors of their narratives and ensure that their stories were authentically represented.

For participants who were less accessible geographically, interviews took place via videoconference (e.g. Blue Jeans). Two of the 16 participants were interviewed exclusively via videoconference, while the remaining 14 had at least one in-person interview. Though a portion of the interviews were conducted remotely, I was still able to develop a strong rapport with each

of my participants. On average, interviews ranged from approximately 1.5 to 2 hours throughout the study period. Each of the interviews were transcribed verbatim for the purpose of coding and analysis. See Appendix F for a table aligning the study research questions with the interview protocol questions and photo elicitation/journal prompts.

Data Analysis

Data analysis was an iterative process, beginning with the writing of "impressionistic records" after each interview, which are reflective pieces that help identify emerging hypotheses, themes, interpretations, and potential dilemmas occurring in the research (e.g., conceptual, methodological, ethical) (Lawrence-Lightfoot & Davis, 1997, p. 188). Interviews with participants served as the foundation of this portraiture study, as listening for participants' voices is an essential component to this approach and the conceptual underpinnings of my research. Much like memos (Maxwell, 2013), these impressionistic records helped capture and facilitate my analytic thinking about my data. These records were revisited throughout the study, as data analysis occurred simultaneously with the data collection.

Revisiting my research questions, conceptual framework, interview transcripts, and participants' journal entries, I developed a codebook (Appendix G) focusing on participant discussions of the engineering context, personal and academic backgrounds, and their spiritual epistemologies and ontologies. I explicitly coded for women's understandings of and expressions of spirituality, critical moments in participants' educational experience, racial and/or gender discrimination experiences in their educational environment, along with moments of resistance, resilience, and transcendence in their doctoral programs. Guided by portraiture, I also looked for evidence of repetition, metaphor, and ritual in participants' transcripts as I coded. Evidence of repetition could be refrains that appear frequently across participant interviews that may convey

commonly held views, such as challenges Black women typically experience in their engineering graduate programs. Metaphors are symbolic phrases or expressions that participants use to explicate a particular feeling or experience. In this study, an example of a metaphor that participants often used to describe their doctoral experience was "searching for a light at the end of the tunnel." Additionally, ritual in portraiture refers to reoccurring practices or ceremonies that occur in an organization, institution, or perhaps a participant's life that offers continuity and coherence. For instance, participant rituals could be regular practices of prayer or meditation throughout their day.

As the photos and journal entries provided by the participants were used primarily as a tool to deepen participants' reflections about their experiences, they were not analyzed for the purpose of this project. However, participants' descriptions and meaning making of the photos and journals as discussed in their second interviews were included in the data analysis. As I coded the second interviews, I also looked for evidence of their sense making regarding why they may spiritually respond to certain contexts more, or less, than others.

As I coded, I wrote additional impressionistic records to capture my thoughts throughout the analysis process and began to identify central themes. I also began writing spoken word poems that highlighted select themes as a way to "reach for the souls" of my participants as I strived to convey holistic portraits of their experiences in engineering (Lawrence-Lightfoot & Davis, 1997, p. 238). Moreover, the spoken word poems helped me synthesize my research findings and weave multiple participants' stories together as brief portraits to conclude each findings chapter.

The findings for this study are organized into three chapters based on my research questions. In the first findings chapter, I answer the following questions: How do Black women

in engineering doctoral programs understand, describe, and express their spirituality? When, where, and with whom do Black women in engineering express their spirituality? Additionally, the presentation and analysis of my data is informed by my literature review which resulted in a focus on transcendent forces, self, and others in my conceptualization of participants' spirituality. This chapter also uses data from the first and second interview outlining first what women's understandings of spirituality were, then explicating the various ways, places, times, and people with which participants enacted their faith.

The second findings chapter focuses on the research questions of: To what extent, and in what ways, does spirituality inform resilience, resistance, and transcendence among Black women pursuing engineering doctorates? How do Black women in engineering doctoral programs describe their experience in their educational environment, and how does spirituality help them to navigate the challenges and assets of that context? How are race and/or gender implicated in the challenges and successes that Black women in engineering experience, and how does spirituality help them to navigate those particular challenges? This chapter utilizes data gathered from all three interviews. Through this chapter, I highlight participants' racialized and gendered experiences navigating their engineering educational environments and the role of their spirituality in such contexts.

Finally, the third findings chapter answers my last research question concerning how, if at all, is spirituality implicated in Black women's work as engineers (e.g., in their knowledge claims, in the ways that they understand what is valid, in the creative process, in problem-solving, and in engaging others in collaborative processes) and to what extent do Black women in engineering experience conflicts between spiritual and scientific epistemologies? In this chapter I also highlight areas of alignment between participants' spiritual and scientific

epistemologies and ontologies. Additionally, I discuss participants' responses to tensions between their spirituality and science, and the possible implications of those responses on their post-doctorate career pathways.

Each chapter in the findings section opens with a singular portrait of a participant whose experiences help illuminate the study themes. I then expound on the themes with additional examples from other participants, briefly summarize the content of the chapter, and conclude with a poem that illustrates participants' collective experiences and key themes. The discussion, implications, and conclusions of the study are offered in a fourth and final chapter.

Trustworthiness

To enhance the trustworthiness of my study, I employed a variety of strategies. Over the course of conducting three interviews with my participants, I established a strong rapport with each of them and engaged them as co-constructors of their narratives. In the third interview, participants had the opportunity to revisit their own stories and offer additional reflections about their experiences. Additionally, when participants requested that I not disclose certain aspects of our conversations, I honored their wishes and asked why they desired particular experiences to be removed and if there was another story they wished to share.

Additionally, I engaged in peer debriefing by presenting preliminary findings to a student group of women in STEM fields at my current institution, and requesting their feedback about my interpretations of the data. This presentation and feedback session took place after I coded and analyzed my first round of participant interviews. Lawrence-Lightfoot and Davis (1997) suggest that in portraiture, "the portraitist seeks to document and illuminate the complexity and detail of a unique experience or place, hoping that the audience will see themselves reflected in it, trusting that the readers will feel identified" (p. 14). Thus, allowing this student group to

receive and respond to my work, helped me determine if my preliminary findings were resonating with women in STEM outside of my participants. During the peer debriefing session, I asked attendees to provide feedback on the clarity and persuasiveness of my arguments based on the quality of my evidence. I also engaged my peers and faculty members in ongoing discussions about my data analysis and findings for additional feedback.

Finally, I sought out and attended to deviant voices (Lawrence-Lightfoot & Davis, 1997), or discrepant evidence, in my study by highlighting instances where participants' experiences did not align with my conceptual framework. For instance, uplifting examples where participants felt well supported spiritually and intellectually in their engineering contexts. I also asked my participants about moments where they may have experienced challenges with their spirituality or conflicts between their spirituality and other social identities that they may hold. Though contrary to my conceptual framework, such instances provided additional complexity to my understanding of the spirituality and experiences of Black doctoral women in engineering.

Positionality

As a Black Christian woman who earned an engineering Bachelor's degree in a historically White institution, I am deeply interested in and intimately aware of the ways that spiritual epistemologies and ontologies can play a role in one's engineering educational pursuits. During my undergraduate experience, I relied heavily upon my spirituality to help me make sense of my academic experiences and find the motivation to continue my studies. I have experienced the deleterious effects of gendered racism—the intersection of racism and sexism—(Essed, 1991) in engineering firsthand and vicariously as I worked to complete my degree and eventually pursued a career in higher education supporting underrepresented STEM students. My research interests in this topic are strongly motivated by my academic and professional

experiences, along with my desire to lift up the spiritual epistemologies and ontologies of Black women in engineering. It is my hope that this work will challenge institutions of higher education to create more inviting and inclusive educational environments for Black women that embrace them holistically, including their spirituality.

Additionally, my use of portraiture as a method and unique presentation of study findings is largely inspired by my identity as a poet and spoken word artist. For seven years, I stopped writing poetry as I struggled to find my voice in academic writing. However, it was during my doctoral program that a mentor encouraged me to take the time to do something that brought me joy, and in response to her request, I wrote a poem. That first poem—after my seven-year hiatus—helped me rediscover my love of poetry and spoken word. Moreover, it inspired me to consider how I might bridge my academic writing with the emotion, lyricism, and joy of poetry. In reading the Art and Science of Portraiture, I could see a clear path to honoring my identities as a social scientist and poet, using the skills I possess in research and language to render authentic, moving portraits of my participants. Moreover, in crafting the poems, I was able to tap into the feelings and experiences I had navigating STEM contexts academically and professionally, which added another element of self to the portraiture process. Poetry was a way for me to harmonize with the voices of my participants, while still maintaining the integrity of their narratives.

Ethical Considerations

As discussed in Chapter 1, I utilized Dillard's methodology of surrender to inform my approach as a researcher to this study. According to Dillard, methodology of surrender entails embracing a meditative and faith-filled research space that promotes love, compassion, reciprocity, and ritual.

Love involves re-conceptualizing the researcher/participant relationship. To love the people or communities that one is researching, the researcher must look and listen carefully to her participants in order recognize their truths. Thus, in loving one's participants, the researcher becomes committed to serving them and "creat[ing] more reciprocal (and thus more just) sites of inquiry" (Dillard, 2006, p. 84). Regarding my work concerning the role of spirituality in the lives of Black doctoral women in engineering, I showed my participants love by remaining attentive to their body language, tone, and delivery as we engaged in conversation. If a normally open and vivacious participant appeared to be guarded and more reserved, I noted those shifts and acknowledged them during the dialogue. I also extended love to my participants by attentively listening to their stories and handling them with care in the interest of authentically and respectfully representing them in such a way that they could recognize themselves and perhaps leave the research experience with a clearer understanding of how spirituality operated in their lives as Black women engineers. This principle also aligns with portraiture in that relationships fostered between researchers and participants are meant to inform all aspects of the study from beginning to end. Lawrence-Lightfoot and Davis assert that "relationship is not confined to the process of data collection, it is imprinted as well on the final product, the research portrait. The rapport forged in the process of co-constructing narrative is respected in the final product through which the narrative is shared with the reader" (p. 160).

Compassion refers to the "intention and capacity to relieve and transform suffering through our research work" (Dillard, 2006, p. 84). As a researcher, being compassionate towards the people or communities one is researching means caring deeply and desiring to bring them joy. Portraitists also attend to compassion by committing to do no harm and protecting

participants as necessary in the crafting of the final portrait. Lawrence-Lightfoot and Davis (1997) write:

> The question that portraitists must repeatedly ask of process is, How can I forge a relationship sufficient to inform (authenticate) the product (the developing portrait) while doing no harm to the subject? And the question that portraitists must repeatedly ask of the product is, How will the representation of what I have learned through relationship give shape to the whole (the developing understanding) while protecting the actors on the scene? (p. 161)

Applying the principle of compassion in my work, I consistently checked in with participants as they shared difficult or potentially painful experiences during interviews, prioritizing their well-being during the research process. I also thoughtfully considered which stories I would incorporate in the portraits being mindful of the sensitivity of participants' narratives and also their anonymity as underrepresented members of their fields by race and gender. I also purposefully strived to encourage my participants' as they described moments of uncertainty and doubt over the course of our interviews. A specific strategy I employed was sharing quotes with participants from their previous interviews when they spoke of overcoming obstacles or having faith that they would achieve their goals.

Reciprocity entails bridging the divide between the researcher and the participant by recognizing all human beings as equal and eradicating the artificial boundaries created to distance oneself from another. According to Dillard (2006) "imagining one's self as another—and all of us as spirit beings having human experience—is the only way to narrow the chasm between the 'differences' that are so often the topics of our academic discussions and work" (p. 85). For me, demonstrating reciprocity involved seeing myself in the lives of participants, and

being attentive to their needs and desires foremost rather than my personal agenda. At the time of consent for the project, I inquired if participants would be interested in joining a voluntary support group or forum where they could connect and uplift one another as spiritual Black women pursuing their engineering doctorates after the study concluded. During the third interviews, I asked participants for their perspectives on what such a group would look like and what they would find most useful in terms of format and frequency. Ultimately, I intend to use the information to develop a support initiative for Black women in STEM that endures beyond the scope of the research project. Lawrence-Lightfoot (2005) asserts that portraitists can "instigate positive and productive change" through their research, which is my intention for this study and the support initiative that stems from it. Additionally, at the conclusion of the data collection, along with their monetary incentives, I gave each of my participants handwritten thank you notes with messages of affirmation and appreciation for their involvement in the study. I also invited participants to remain in contact with me after the study to continue to build upon the relationships we established.

Finally, ritual involves "unifying the human and the divine" (Dillard, 2006, p. 85). To engage in a ritual involves remembering that research is not only an intellectual pursuit, but also a spiritual one. Further, ritual engages the spirit in honoring those living and deceased, and the transcendent forces that provide researchers with the strength and ability to participate in the research enterprise. Considering ritual in terms of my research practice, I remained attuned to my spirituality through prayer, reflection, and journaling throughout the research process. As I sought wisdom through prayer and reflection, consistently journaling allowed me to capture my meditations, questions, and insights during the project. Writing poetry was also a part of my ritual for this project, as spoken word helps me to translate the stories I am hearing as a

researcher into a creative medium, which in turn provides an outlet for me to process my own thoughts and emotions about what was shared.

In Black feminist thought an ethic of care is comprised of three components: personal expressiveness, emotion, and empathy. Personal expressiveness speaks to the value of individual uniqueness within Black communities. Hill Collins (2000) shares, "Rooted in a tradition of African humanism, each individual is thought to be a unique expression of a common spirit, power, or energy inherent in all life" (p. 263). Therefore, unified by the animating power of life, individuals are expected to uniquely contribute to the beauty of human experience while still being connected to the whole. In other words, personal expressiveness celebrates individuality within the collective. Concerning emotion, Hill Collins (2000) states, "emotion indicates that a speaker believes in the validity of an argument" (p. 263). From a Black feminist thought perspective emotion is intrinsically tied to intellect. Using the example of Black women's blues tradition, Hill Collins asserts that powerful lyrics combined with a singer's emotional delivery inspires conviction in the audience and denotes the performer's belief in the song's message. Empathy refers to a Black woman's ability see herself in another's experience and thereby better understand that person. Portraiture also calls for empathy between the portraitist and study actors to enable the researcher to connect with the experiences and emotions of her participants (Lawrence-Lightfoot & Davis, 1997).

> Deep understanding and intimacy, of course, require that the researcher not only see the actor's reality and respect the actor's frameworks and perspectives, but also that she *herself* be self-reflective and self-analytic. That is, when the actor calls up haunting memories and vivid experiences, the portraitist must also be able to identify resonant experiences and similar feelings in herself. (p. 148)

Within Black feminist epistemology, when an individual makes a knowledge claim, whether a participant or a researcher, that person's character values, and ethics are also subject to evaluation (Hill Collins, 2000). The ethic of personal accountability refers to the expectation that a person is responsible for their knowledge claims. Hill Collins (2000) remarks, "knowledge claims made by individuals respected for their moral and ethical connections to their ideas will carry more weight than those offered by less respected figures" (p. 265).

Black feminist ethics of care and personal accountability are quite similar to Dillard's methodology of surrender. As Hill Collins (2000) speaks to the importance of empathy, Dillard (2006) relatedly discusses the importance of compassion in the research endeavor. Further, Hill Collins descriptions of personal expressiveness and personal accountability aligns with Dillard's focus on ritual and reciprocity in the sense that research as a spiritual enterprise attends to the humanity and innate spirit within one's participants and oneself as a researcher, while respectfully and responsibly honoring their unique experiences. Finally, Hill Collins' and Dillard's work converges yet again in their discussions of emotion and love, respectively. Just as emotion adds validity to one's knowledge claims, a researcher's love for one's participants validates the research endeavor by fostering more reciprocal and, in turn, more just sites of inquiry (Dillard, 2006). As emotion helps convey the sincerity and belief of one's message to another, love similarly helps researchers convey their participants' experiences with sincerity, honesty, and integrity.

Both Hill Collins' and Dillard's approaches take up the importance of values and interpersonal connection in the creation, assessment, and validation of knowledge. Hill Collin's and Dillard's work also resonates soundly with portraiture in that the relationships cultivated in the research endeavor are "more than vehicles for data gathering, more than points of access.

[Portraitists] see them as central to the empirical, ethical, and humanistic dimensions of research design, as evolving and changing processes of human encounter" (Lawrence-Lightfoot & Davis, 1997, p. 128). Dillard also suggests that research as a spiritual practice depends on intimate interpersonal connections, which ultimately inform what becomes known. Dillard (2006) states,

> Thus, this endeavor called research is not just in the abstract, but experientially, through spiritual practice creating praxis: As researchers, whether we choose to be in more intimate and human relationship with the subjects of our work and whether we choose to be subjects within the work ourselves will make the ultimate difference between the lessons we learn and the lessons we just "think about." And it will make a profound difference in how we conceptualize and engage methods that attend to the spiritual nature of our human relationships within our research. (p. 81)

Study Contribution

This study valuably contributes to the extant literature pertaining to Black women's spirituality in higher education by demonstrating how spiritual epistemologies and ontologies inform Black women engineers' way of life, including their resilience, intellectual work, career decisions, empowerment, joy, and passion for what they do. Additionally, this study expands the literature concerning Black students in STEM, by centering the experiences of Black women who have persisted to doctoral study in engineering and perhaps have used spiritual epistemologies and ontologies, in addition to other strategies, in order to do so. In focusing on the spirituality of Black women in engineering, I am disrupting dominant narratives that attempt to divorce science from the sacred, while simultaneously foregrounding and legitimizing Black women's ways of knowing, seeing, and operating in a predominantly White and male discipline.

Describing the principles of Black feminist epistemology in relation to the assessment and validation of knowledge, Hill Collins (2000) writes,

> Neither emotion nor ethics is subordinated to reason. Instead, emotion, ethics, and reason are used as interconnected, essential components in assessing knowledge claims. In this alternative epistemology, values lie at the heart of the knowledge validation process such that inquiry always has an ethical claim. (p. 266)

Therefore, I take up this dissertation study as a values-driven, spiritual endeavor that allows me to collaborate with my participants as agents of knowledge and fellow human beings worthy of respect, honor, and great care.

CHAPTER 4

Conceptualizing Spirituality

Portrait of Amaani

Settling in her chair, Amaani paused and took a breath before delving into the pivotal moments of her spiritual journey that eventually brought her to the small, windowless study room where our first conversation took place. One memory that quickly came into focus was from 2015, at a game night with her engineering cohort mates. As the evening began to wind down, a developing news story on television caught the room's attention. Coverage of the Baltimore riots in response to the killing of Freddie Gray, an unarmed Black man in police custody, sparked an unexpected conversation about race, police brutality, and privilege.

> We got into a general discussion about White privilege and what it means to be Black in America and everything that comes with that conversation, and I was confronted with the fact that they didn't understand what it meant. They didn't understand what White privilege meant. If they knew what it meant, they didn't really know what it meant. They didn't know how they themselves were benefiting from their whiteness, how it felt to be a Person of Color in America but also in this space that we're in, this academic space. I guess I was confronted with all of this, and this was like the first time that I was really confronted with it because we never would talk about these things.

Amaani, described this moment and presumably others like it happening across the United States as the "beginning of reckoning with these topics for a lot of people, for a lot of White people." However, it was also a moment of reckoning for her. The sole Black woman, surrounded by her White cohort mates, grappling with a sudden hyper-awareness of her own identities and the growing distance she felt from the people just hours before she may have called friends.

For Amaani, that evening's discussion, marked an important moment in her spiritual life because she was confronted with the intersections of her faith, social identities, and injustice. At the time, Amaani was in her first year of graduate school, but her conversation with her peers that night made her reflect on her childhood spiritual community. Recalling her religious upbringing, Amaani shared how she and her family attended a predominantly White, conservative Christian church in a predominantly White neighborhood in the south. Though unaware at the time, as a graduate student, Amaani later came to realize that belonging to one of the only Black families in the congregation meant that her understanding of religion and self was steeped in Whiteness.

> In school, in church, in my community, I had never been in a community where I felt like the majority of the people around me, I could identify with. So, a lot of the Christianity that I learned growing up was tied to those White people that I grew up with and the White people that I went to church with. That wasn't an issue until recently. I didn't realize that this was an issue until recently.

The issue being that Amaani felt her primarily White spiritual community was not as sensitive to the plight of minoritized people, and her developing understanding of spirituality encouraged her to resist the perpetuation of oppression against marginalized people. As one of the few Black members of her congregation, Amaani surmised that her previous church community's seeming

indifference to social injustice may be have been due to their privilege as members of the dominant racial group.

> I feel like there's certain things as someone who is part of a marginalized community in society [that] you have to grapple with that White people, White men don't have to think about…I have to think more now because I'm a Woman of Color and because I feel like I identify with other groups, other communities that have been, have felt particularly attacked by scripture and the way that certain people interpret scripture. So, whether that be like, people that are part of the LGBTQ community—I'm a straight cisgendered person so I don't feel, I'm not directly part of that community, but I consider myself and ally to that community and I'm not okay with just being like, "oh whatever the Bible says about being gay, that doesn't affect me so I don't have to think about it." I'm not going to do that because I know what it's like to be part of a marginalized community and if there's another community that's also dealing with oppression, I want to side with them. I want to lift them up as well.

As a woman of color, Amaani's spirituality was deeply influenced by her racial and gender identity, which challenged her to critically examine and carefully interpret religious doctrine in an effort to not oppress other marginalized groups.

> I feel like, I don't know, I almost feel like being spiritual, for me meaning like, being a Christian and believing in God, it's a lot more work than what I thought it was when I was growing up in church because for those people it wasn't a lot of work. They were, they didn't have to deal with all these different identities that are seemingly opposed to their belief in scripture and God.

Despite Amaani's burgeoning sense of self and connection to the shared struggle of oppressed people, she found it difficult to disentangle her own spirituality from the vestiges of her spiritual upbringing. In her second year of graduate school, still reeling from the outcome of the 2016 presidential election, she realized that her childhood church community members were likely staunch supporters of the sitting president; a realization that made her question how she could share the same faith with people whose political ideologies differed so greatly from her own.

> They had this ideology that I didn't agree with, but my identity and Christianity was always tied to those people. So, I couldn't separate... I felt like if I am a Christian, and I have this relationship with God, whatever that looks like that I was taught by those people in the church, if I have those things, then I'm tied to those people. I felt like those two things were connected. So, I didn't know what it looked like to have a relationship with God that was truly my own and in my own identity because it was tied to their identity. And I definitely didn't want to be tied to them.

What Amaani did not anticipate was that her desperation to release the ties anchoring her to her former church would leave her spiritually adrift. From Amaani's perspective, "It didn't make sense bridging my world and their world and being Christian." Amaani described her relationship with God during her first few years of graduate school as nonexistent, which coupled with the increasing demands of her engineering doctoral program left her spiraling into a depression.

Reflecting on that period, Amaani felt she was missing a key element of her spirituality—a genuine connection with God. In Amaani's experience, God was not a distant entity, but rather a higher power that she could have an intimate relationship with. Prior to graduate school,

Amaani viewed God as accessible, reliable, and present in times of trouble and success. Yet, in Amaani's struggle to separate her own spirituality from that of her childhood religious community, she felt as if she had simultaneously separated herself from God.

> In the past, I would rely on God to get me through everything, things started going bad in my research, I was feeling depressed, and I also didn't have God. I felt like everything was out of my control, but that God wasn't there because I had abandoned Him.

Fortunately, Amaani recognized the need for a change in her life and decided to return to therapy in her fourth year as a graduate student. It was in therapy that Amaani was able to discuss her spirituality and the role that God had played in life up until that point, but also how she found it difficult to maintain a relationship with God when it seemed as if her faith was inextricably connected to the community she wished to escape from. Taking in Amaani's story, her therapist gave her a piece of advice that soundly resonated. She said, "your spirituality and your faith is only your own, and you have to figure out what that looks like for yourself." As Amaani digested her therapist's words, she faced another profound moment of reckoning. Somehow, she needed to bridge her sociopolitical beliefs with her faith so that she could remain true to herself, connected with God, and in right standing with other minoritized people she felt solidarity with.

> I feel like I was confronted with a lot of those difficult topics that I was taught to just like, "This is right. This is wrong. And that's it." I was confronted with a lot of that in a time when my faith wasn't really there. I came to the opinion of, "I don't believe that it's wrong to be gay. I don't believe that women aren't allowed to have roles of power. I don't believe that women are less than men." All of these things, I solidified all of these beliefs that I had and I felt fine because I was like, "I don't really have a relationship with God right now so, I like these things, I'm just going to believe these things and I feel fine

> and I don't feel like God's smiting me." But then more recently when I decided I need God, that's when those two came together. That's when I came to the realization like, "Okay, I need to figure this out because I'm not comfortable going back to not having those opinions or those beliefs, but I'm also not comfortable abandoning my relationship with God." That is still the biggest challenge in my spirituality right now is truly having a relationship with God, an all-encompassing relationship with God where I talk to him about all of these issues that I would just ignore previously when I felt like I was strong in my faith.

Though Amaani was still navigating her spiritual journey the evening we met and throughout the duration of our time together for the study, she seemed assured that she was heading in the right direction. As a fifth year in doctoral program, she was making meaning of her spirituality for herself, which felt like progress.

Conceptualizing Black Women's Spirituality: Transcendent Forces, Self, and Others

For Amaani—and the other Black women in the study—God, self, others, and the interrelationships between the three coalesced to form their spirituality. Participants' descriptions of their spirituality revealed: 1) belief in and relationship with transcendent forces (e.g., God); 2) understanding and development of self; and 3) accountability in relationships and interactions with other people were all integral aspects of their conceptualizations of spirituality (See Figure 1.). Here, I briefly illustrate the themes found in four participants' discussions of their spirituality, which I elaborate further in this chapter. Following the overview, I discuss participants' enactment of their spirituality in detail, and then briefly summarize the chapter, concluding with a poem that illustrates some of the themes.

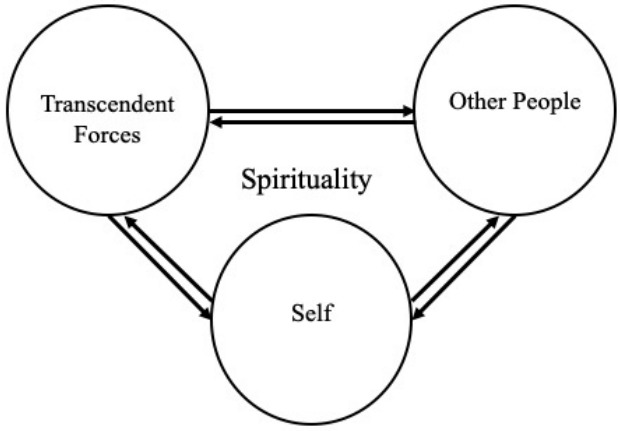

Figure 1. Conceptual Model of Spirituality

Amaani's story illuminates the complex, multifaceted nature of Black women's conceptualizations of spirituality. As she became more socially conscious of her identity as a Black woman, she began to reexamine her relationships with others—first her engineering peers, then her childhood spiritual community, and later members of other marginalized groups—which prompted new considerations about her connection with God. Amaani's struggle to make sense of the intersections of self, others, and God, provides insight into how Black women in the study may conceptualize the totality of their spirituality.

Similar to Amaani, other Black women in the study described how their spirituality encompassed their belief in and relationship with transcendent forces, or higher powers—most often referred to as God—as well as their understandings of self and relationships with other people. For example, Michaela, a seventh-year doctoral student attending a historically Black institution, emphasized the importance of having an intimate relationship with God in her definition of spirituality. She shared,

> It just means that you have this alignment, this wholeness, this certainty, this belonging. Like, there's no separateness. It just means that everything is. It's like you're just one with God. You're not separated from him so everything that you do, everywhere that you are, it's kind of like everything is where it's supposed to be. So, to me, that's what spirituality is.

What Michaela's understanding of spirituality highlights is the assurance and sense of belonging that she experienced from having a close and personal connection with a higher power. Amaani expressed similar sentiments in our later conversations, stating, "Now, I feel like I just want to live my life day-to-day with God by my side…" For Michaela and Amaani, among other Black women in the study, spirituality meant more than simply believing God exists, but being one with God and experiencing the fulfillment and purpose that comes with that oneness.

Nadia, a sixth-year doctoral student at a historically White institution, spoke of how in addition to believing in a higher power and being mindful of her actions, her spirituality encouraged her to really love herself and accept the person that she was.

> I think it has to do with love, like loving yourself and appreciating yourself for who you are, which is almost the same thing, but just adding love back into it. Because love is the essence of everything. So, loving yourself, and being true to yourself. I think that's what spirituality is, because each of us have our own unique gifts and that's what makes us, us.

Nadia's spirituality gave her the freedom to strive to be her most authentic self and appreciate her uniqueness. Her spirituality helped her to truly love herself as she was and would become, which was powerfully affirming for Nadia. Relatedly, Amaani discussed arriving at a place of self-love and acceptance as she progressed in her spiritual journey. Recounting her early experiences in her predominantly White childhood church, she described being especially aware

of her race and the differential treatment she received as a result of that. However, when asked what guidance she would offer that younger version of herself, Amaani confidently asserted her beauty and self-worth.

> We were one of two Black families in the church. I remember always being aware of my race, and the fact that people didn't view me the way that they viewed my friends in the church. That had a really big effect on me. I think I didn't realize how big of an effect it had on me until later on in life, like in undergrad. Somebody actually, I mean I think every Black girl probably has a story about somebody saying that they're pretty for a Black girl. That was my experience in this church, amongst the people that I was with in the church. There was a lot of that, just always feeling like I wasn't as good, or as pretty. If somebody else did something, then they would get praised for it, but if I did the same thing, I wouldn't get as much praise for it, that kind of thing. I would just tell my younger self that I am worthy of...That I'm beautiful, that my skin color doesn't make me less worthy than anyone else. That one day I'm going to realize that, and I'm going to feel a lot better, and things will get a lot better.

Much like Nadia and Amaani, several participants described their pathways to better understanding and loving themselves as a part of their spiritual development. For many, that understanding came from believing that they were uniquely and intentionally created by God, which encouraged them to love themselves as they were.

According to Celeste, a fifth-year doctoral student a historically Black institution, her spirituality helped her embrace her uniqueness and also influenced her treatment of other people. Guided by her spirituality, Celeste felt it was important to treat others with respect and kindness.

> My spirituality is probably majority of my personality, my everything. I want to say I'm a character, but I would say I'm very unique and I feel like my spirituality plays a huge role in that. An example of that is, I treat people how I would like to be treated. I don't care what you looked like, how you act, that's just innately in me. So, whereas some people may not speak to someone that looks a little disheveled, I may speak to them like, if they could be the CEO of a company. Because you just never know who you're talking to. But that comes with how God wants us to treat each other.

Celeste's comments demonstrated how interactions and relationships with others are key aspects of her understanding and operationalization of her spirituality. Being spiritual encouraged Celeste to consider how she treated others and how she allowed other people to treat her. Celeste spoke of relationships on the interpersonal level, yet her remarks align with Amaani's discussion of being conscious of how society treats others. Amaani's solidarity with other marginalized people stemmed from an empathetic response to others' suffering.

> I know what it feels like to have racial slurs thrown at you or to experience microaggressions that you know are racially motivated, but you feel like you can't say anything because then people will be like "oh you're pulling the race card." I know what it feels like. When I see Black people being mistreated, I have an emotional response to that because that's my community.

While some participants spoke of the importance of interpersonal relationships and connections with others, as Celeste did, there were others that broadened the scope of relationships like Amaani, accounting for how their spirituality informed their views on social justice and the treatment of other minoritized communities.

Taken together, Amaani and other participants' discussions of their spirituality highlight the importance of transcendent forces, self, and others in Black women's conceptualizations of spirituality in the study. What adds to the complexity of participants' conceptualizations of spirituality is the interplay between these three aspects. For example, Amaani's relationship with God became strained as she grappled with how to disassociate her faith from that of her previous spiritual community, while adopting anti-oppressive, socially just ideologies based on her lived experience as Black woman in the U.S. In the sections that follow, I discuss the interrelationships between the key aspects of participants' spirituality more in depth.

Transcendent Forces and Self

Study participants described multiple ways in which their belief in and relationship with transcendent forces, or higher powers, influenced their understandings and development of self and vice versa. Several participants shared how their sense of connection with God contributed to their own sense of identity and how their social identities (e.g., race, gender) informed their perceptions of the nature of God. Furthermore, they described how their relationships with God informed their meaning making and understanding of life purpose.

Transcendent forces inform self. For multiple participants, having a personal connection with a higher power influenced how they viewed themselves. Often, this relationship imbued participants with confidence and reassurance that they were people of importance to God, which affirmed their self-worth and gave them a positive outlook on life. Participants also described this relationship as evolving with time and maturity. For instance, Michaela discussed how early in her spiritual life she perceived God as a distant entity, but as she grew older, she came to understand God as a constant companion, completely invested in every aspect of her lived experience. She shared,

> To me I always felt like God was so distant and far away, away up and when you're literally just like, "He's way up in the sky…" As you get older, you start to know that He's right there with you all the time and He sees everything that happens to you and He feels everything that happens to you and He wants everything, the best for you. So, you start to think of Him. I always start thinking of Him seeing me, it's a very special, unique flower that He's created… He's given me a divine purpose, so there're things that He has here for me to do, but He accepts me and it's like I'm still this beautiful flower that is just meant to do all these great things.

Michaela's description of herself as a "very special, unique flower" created by God, denotes an understanding that she was made with care and great love; in turn, allowing her to see herself as precious to God. Her relationship with God also helped her realize that she has a purpose that she was intentionally designed by God to accomplish. For Michaela, her sense of self and identity were intrinsically connected to God.

Other participants also shared how their connection with God helped inform how they perceived and understood themselves, particularly as people of African descent. For some participants, through personal research and Biblical interpretation, they came to see themselves as potential Israelite descendants, whom they understood to be God's chosen people. Though hesitant to share such beliefs openly, Nadia expressed how believing that she could be an early Israelite descendant increased her faith by allowing her to imagine herself as a member of God's chosen people.

> Also, there's some science behind it in terms of the skulls of the people in Egypt, the Hebrews that were buried there. Their skulls match African-Americans, but don't match others, things like that. I believe that I'm a descendant, but I don't share. It's hard to

> believe something and not share it. It just gives me more faith to know that I'm an important person of God, a person of God.

Nadia's reticence to share her beliefs was not due to uncertainty about them, but rather her concern that others might perceive her views as anti-Semitic. She felt that members of the Jewish community might be offended that she believed early and modern-day Israelites were actually people of African descent. However, seeing herself as one of God's chosen people was empowering for Nadia. Nadia later added,

> Think about the history that African Americans have had in this country and to believe for a second that you are not just a slave or a child of a slave, you are God's chosen people who do get enslaved a lot for whatever reason…of course people want us to believe that we're people of slaves because that's what America is used to. They probably don't want us to think that we're above and there's evidence to show that the White race is intimidated by us.

Believing that she could be one of God's chosen helped Nadia imagine an ancestry that did not begin, or was defined, at the point of slavery. Further, Nadia's beliefs are grounded in a critique of racism and anti-Blackness. She noted that racially dominant members of society were likely to disagree with her beliefs in the interest of maintaining White supremacy.

Parker held similar beliefs. In our interview, she specifically referenced passages of Biblical scripture that alluded to how Israelites in the Bible were more likely to resemble People of Color rather than Whites. Like Nadia, Parker believed that she could be descended from one of the twelve tribes of Israel.

> A lot of times, and when you look at spiritual, yes, biblical stories, they're portrayed as Caucasian males and females. When you actually sit down and read the Word, they're

> everything but Caucasian…That was huge to me knowing that Israelites are God's prize possession. Okay, it's not like the Bible stopped or Old Testament stopped.

Parker considered the Bible to be a historical record documenting the lives and lineages of actual people, meaning that descendants of early Israelites existed in modern times. This belief led her to assert, "Yeah, I could be a Israelite. Well, I could be a Levite, who knows?" What is especially profound about Nadia and Parker's propositions, is their critical response to traditional Biblical interpretation that depict early and modern-day Israelites as White, as well as their ability to imagine themselves as Israelites of African descent. In spite of dominant Judeo-Christian portrayals of God's chosen people as White-appearing, these Black women could see themselves as a part of that history and legacy, which informed their spiritual identities and strengthened their sense of personal connection to God.

Self informs perceptions of transcendent forces. Black women in the study also spoke of how their social identities, specifically their race and gender influenced their perspectives on the nature of God. For example, Taryn speculated that if she, as a woman, and men were both made in the image of God, then God must not be limited to one, definitive gender.

> People are like, "God, He", you know? The other day I was like, man, I'm female. I'm made in the image of God. So, guess what? God's genderless. So now I can be like God is a she too…God's a being…you know, he or she has no gender.

Kala took a slightly different stance, asserting that God must be a woman and more specifically, a Black woman. She could envision God as being a woman and Black because she could see herself in God and God in herself. Kala stated,

> I've like had these two revelations in my life where Eve didn't eat the apple, and God is a woman. I'm truly embracing that now because first of all, I don't think Eve ate the apple

> because, why do men have Adam's apples and we don't? Then on top of that, the Bible was written by men. Of course they're going to paint themselves in a good light to try to make women be the weaker sex. But when you think about it, God made the world, He created life. You can only give birth through a woman. That is creating life in itself. I am a woman, I am Black. I think everything you need in life is in Africa. Everything you need to be like healthy.

Both Nadia and Kala attributed dominant depictions and interpretations of God as a man to patriarchy and sexism. However, their creation of spiritual counternarratives challenged dominant portrayals of God and better suited their worldviews.

Transcendent forces inform meaning making and understanding of purpose. Participants also referred to how their relationships with God helped them to make sense of their lived experience and come to understand their purpose in life. An especially illustrative example of this came from Maya, who had a near-death experience that prompted her deepen her relationship with God in pursuit of her life purpose. Reflecting on her feelings and the meaning-making she did during the time of her recovery, she shared,

> I felt so empty and so... If my life could be taken away just like that... It's just like if all that could just be taken away due to something out of our control, then what's the purpose of life, and what's the purpose of everything I've done up to that point? Then I recognized that God saved me from that event and that He has a purpose, and that I guess we don't have to be afraid, because even though this life is temporary and fleeting and there's so much pain, God promises eternal life, which isn't temporary, it's permanent. I decided like okay, I'm going to spend the rest of my life living for God rather than living for this world.

Maya's belief that God had spared her life for a reason, inspired her to discover her purpose and appreciate how precious her limited time in this world was. After almost dying, Maya had a new appreciation for the temporality of life, and determined that she wanted to spend her remaining days "living for God," which meant being a vessel for God's purpose in the world. Her faith in and relationship with God, helped her make meaning of a traumatic life event and use it as motivation to lead a purpose-driven life.

Transcendent Forces and Others

In addition to describing the interconnections between a higher power and themselves, Black women in the study also discussed the relationships between a higher power and others. Participants' belief in a higher power helped guide their interactions with other people. For some, this meant prioritizing helping others, or in accordance with biblical teachings, choosing to forgive those who may have hurt them. For others, being in relationship with a higher power encouraged them to be ambassadors of their faith for other people and reflections of God's love. Other people also played a role in promoting or deterring participants' relationships with a higher power.

Transcendent forces influence relationships and interactions with others. During my first conversation with Harmony, she shared a powerful epiphany. She realized that according to Christian theology, God is in community, based on the concept of the Holy Trinity (i.e., God the Father, the Son, and the Holy Spirit). For Harmony, this realization illuminated why it is so important for humankind to be in community with one another.

> In the Bible, God calls us a community and different things like that, but the biggest epiphany picture was when they were like, "Even God is in community" in terms of the Trinity: the Father, the Son, and the Spirit, and God has made us in His image. If God has

> made us in His image and even God has to be [in] community, how much more do you think you need to be in community? Ever since then, I was just like...I've been doing everything all wrong, thinking I could do this by myself type of thing. It's just like, literally every aspect, I feel like, of God's creation just screams "connectivity" to other things.

Harmony's revelation about the very nature of God—reinforcing humanity's need for connection and community—changed her perspective on getting through life on one's own. Her understanding of God motivated her to foster relationships with other people, and to try to create community in her academic and spiritual environments. Whether she was developing peer study groups, or leading church ministries, she attributed her desire to make connections with others to her faith in God and belief those actions were a part of God's will.

Several other participants discussed how their faith inspired their interactions with other people. Cadence spoke of how being a good person and helping others was aligned with God's desires for humanity. From her reading of the Bible, being good to others was an integral part of Cadence acting out her faith.

> I guess just in my day-to-day life just going out and just being a good person. 'Cause I feel like that's what God wants us to do essentially. Just having read the Bible multiple times, that's just the theme throughout. You just be a good person. So, if I can, I will sometimes even go way out of my way just to make sure just to help people. Just being a good friend. Being a good colleague.

Giving an example of how she has helped others, Cadence recounted that during bad winter storm she received two separate requests for rides to and from the airport. Considering the

weather conditions and her own safety, she remembered wanting to "selfishly stay in and watch TV," but she had a change of heart and decided to help both people despite the inconvenience.

> So, yeah. I got a little less sleep than I wanted to, but I mean it worked out. 'Cause at the end of the day it's do unto others how you want to be done unto you. And, I realized if I was in either position I would want someone— desperately need a friend to help me out—and since I had the ability to, why not?

Cadence links her decision to help her friends directly to her faith. Her understanding of the scripture "do unto others how you want to be done unto you," led her to consider how she would want a friend to respond if she was in need.

Black women in the study also mentioned how their belief and relationships with a higher power inspired them to be role models for others. For instance, Parker said she felt compelled to be a good example of Christianity for a friend who was early in his spiritual journey. "He is in a different place with his spirituality, and he asks me a lot of questions. So, I'm trying to make sure I'm a good Christian for him and not what we see in the news." She believed that the portrayals of Christians in the media, which often focus on radical evangelicalism, false prophets and the like, were not reflective of her faith and relationship with God. Thus, she wanted to be a positive representative of Christianity. Serenity also believed that her faith in God was leading her to be an example for others, but in a different way. Her purpose in becoming an engineer was to be a role model for Black youth in STEM, which she understood was inspired by God.

> I feel like the overall reason for me being an engineer is to be able to just be a representation of what other Black girls and boys can be. To know they can do it, I feel like they have to see other people that look like them. I think that being in engineering and having people reach their potential and all those things all leads to self-confidence

> and people just doing better for the world. That's what Jesus wants. He wants us to contribute and be good people. I just feel like engineering— of course the money and everything is good too—but just contributing to society and being just someone who contributes.

Serenity strongly believed that Jesus Christ—the son of God in Christianity—wanted his followers to be good people and contributors to society. As an engineer, Serenity felt that she would not only contribute to society through her work, but also in her ability to reach young people that may not readily pursue STEM careers, potentially for a lack of role models who look like them.

Additionally, participants discussed how their faith informed their ability to forgive and love others. In acknowledging God's forgiveness of her sins, Lailah realized that she needed to follow God's example and forgive her father for the ways his past infidelities and actions hurt her and her family. She stated,

> I know my father's never repented for hurting me or for hurting my family. But it's just like, no, we're going to forgive because God forgave you first. We're going to just give forgiveness and let it go because God forgave you first. Loving people because God loved you first. So yeah, even today, I know my father's not repented, but feeling like I'm doing the right thing because it's what Christ calls us to do.

By forgiving her father, Lailah felt that she was living in accordance with Christ's teachings even though it was difficult. The grace that God afforded her when she made mistakes helped her extend grace to her own parent. Relatedly, Amaani's commitment to loving others and allying herself with marginalized communities was, in part, inspired by her belief that God loves all people. She remarked, "I feel like I know that God loves everyone and that He has room in his

heart for all of us regardless of the way that we were born, regardless of what situations that we were born into." God's abounding and unconditional love, helped Amaani reconcile her investment in social justice with her faith.

Others influence relationships with transcendent forces and enactment of spirituality. Illuminating the bidirectional nature of the relationship between others and a higher power, study participants also described how other people influenced their faith. Black women often discussed the importance of spiritual role models and communities of faith in helping to strengthen their beliefs in a higher power. Typically, participants did not have to go far to find spiritual role models as they were often members of their immediate families. For example, Amaani's mother was someone that she looked to for spiritual inspiration because of her mother's unwavering faith during difficult times in their family. Amaani stated,

> My mom is extremely spiritual. My mom has been through the most. She's been through so much, through all of this, and she's relied on her faith through all of it, which is just so remarkable to me because I don't know if I could if I were her and been through what she'd been through. So, I feel like she helps me to not let any problem get too big to where I feel like I can't rely on my faith. So, I feel like that has helped me cope and if my Mom can trust in God even through what she's been through then what am I you know? What am I doing? I can't say that I can't trust in God, I have to be able to trust in Him to get us through all of this if she's able to still have her faith.

Whenever Amaani faced an especially difficult obstacle, she remembered her mother's unrelenting faith in God, and decided that she would also choose to trust God to help her through her situation.

Several participants offered similar examples, frequently highlighting the significance of maternal figures in their lives in helping them develop and affirm their spiritual beliefs. Celeste looked toward her mother and grandmother as spiritual role models. Growing up, she would watch her mother and grandmother serve the community through their leadership roles in church and work, which instilled a passion in Celeste to help others.

> I mean, you could just see Jesus, God running through their entire soul and being. My grandmother, she's called Mother… everyone flocks to her at the church. It's amazing. They're like, "We love Mother..." And same with my mom. My mom's a nurse and she's phenomenal. She takes her time with patients. She's such a nurturer. So, I know that they thought it was important to pour into me, but I don't think they realize how good of a job they did. They're my heart. They're my everything…Everything I know, they instilled in me because they believed in me.

Witnessing the ways her mother and grandmother cared for other people gave Celeste a glimpse at how God takes care of and loves others. Her statement that she "could just see Jesus, God running through their entire soul and being" demonstrated Celeste's belief that her mother and grandmother were human reflections of God's love, which she desired to emulate in her own life.

Contrary to how others helped study participants affirm and strengthen their faith, Black women also discussed how their interactions with secular communities could prompt them to question or downplay their beliefs. Speaking of her perceptions that the majority of the scientific community is irreligious, Taryn described it being easier at times to follow the majority in those communities.

> I think the majority of the science community tend to be atheists and most of the time it's very easy to swim with the current than against the current. So, you do tend to pick up

these tendencies. Even if you don't want to, it's just so easy to pick them up. And some of these are maybe, you know don't talk about this at work or whatever.

When asked what led her to believe that the majority of professionals in the sciences were atheist, she responded,

> I feel like the people who are most outspoken are atheists. And so, it doesn't even matter if the average are not atheist or if they don't believe in a god or if they just believe in an outer being or whatever. I feel science has a culture where you believing in religion kinda is seen as you being dumb. And I think this is changing now, I definitely think this is changing. But there's that type of perception. And I think it's due to the fact that most of the outspoken people are atheists.

Taryn's perception that the majority of the scientific community, or at least the most vocal, were atheist was echoed by other Black women in the study. Additionally, though Taryn and other study participants felt deeply connected to God and their faith, many found themselves being less vocal about their beliefs while in academic and professional scientific communities for fear it would diminish their credibility as scientists. Based on her observations of science culture, Taryn recognized that believing in God could be viewed as undermining one's intellect, which may have contributed to her "swim[ming] with the current" regarding not vocalizing her spirituality openly while in the company of other scientists.

Serenity also mentioned how other members of the scientific community could influence her personally and spiritually, but she shared that it is her faith that keeps her grounded and focused on her purpose for being in engineering.

> As far as interacting with people every day, obviously I'm around White males, majority White males. Just dealing with egos and just people who you don't really relate to on a

> day to day, and just different personalities. My spirituality just keeps me focused on why I'm there, who are you, what is your role? I think it's easy, by interacting with other people, to kind of start to question things and wonder. I don't know, people can influence you basically and kind of get you off track. Spirituality keeps me grounded, like I said, just keeps my mind at peace and helps me remember why I'm here, what are you supposed to do and just focus and not distracting all the people.

For Serenity, being in a predominantly White male academic and professional environment as a Black woman, meant that she regularly interacted with people who did not share her perspectives or could relate to her experiences, but she relied on her faith to maintain her peace and stay on track academically and spiritually.

Self and Others

Black women in the study also articulated how being in relationship with other people was integral to their spirituality. The relationship between the self and others took various forms for participants, but many spoke of connecting with other people through community service. Participants also described their investment in serving others in the future. Further, participants shared how their existing communities supported them in reaching their goals and overcoming obstacles.

Connecting with others through service. For many participants, engaging in community service was a way for them to connect with other people and enact their faith. For instance, Bree decided that every year on her birthday she wanted to take part in a community service initiative. She shared,

> I volunteer because of my spirituality. I would say. What year is this? 2016 for my birthday I decided I wanted to do some kind of community service event just was like,

> what better way to feel good on my birthday than give to others. So, I did this human race. It's like a walk, run for non-profit organization and it happened to fall right on my birthday.

Bree shared that her desire to serve others on her birthday in particular was a way for her to demonstrate her gratitude for the opportunities and blessings she had been afforded in life, while helping other people receive what they needed.

Similarly, Devon discussed how her church community instilled in her the value of engaging in service. When she was younger she spent time ushering, working in the kitchen, and simply helping where she was needed. By serving in her church, she learned that if every person did their part, a great deal could get accomplished in the community.

> At church on Sunday they were talking about unity in the church and the importance of community and when everyone gives a little bit, like you're able to push the vision forward without the burden falling on one person, and you're just able to do so much more. If you see somebody in need, you don't have to go to deacon to minister… like just help…If everyone does a little or does their part, then you can get just so much further.

Devon later applied the principle of doing her part in the field of engineering by participating in community outreach efforts to get young women interested in STEM fields. Speaking of her service to the engineering community, she said,

> I consider this my part. And then I've done different outreach programs throughout my time here just trying to help young girls get excited about STEM so we can start seeing this diversity within the classrooms or whatever. And then seeing me in my position and knowing that it is attainable, I wasn't perfect, I failed some classes, I failed some tests, I

didn't do everything right, but yeah, you can still get here. Having that vision or that sight to be able to help someone else. Yeah.

Devon believed it was important to help young women see that earning an engineering degree was attainable because they could go on to be the next generation of STEM students and professionals. By doing her part in engaging in community outreach, she felt that she was playing a role in fostering diversity in STEM fields. Like Devon, Aliyah also made it a point to participate in STEM outreach initiatives to inspire young people to pursue STEM careers.

> It's so important to me, because it was just like…I'll never forget one of the girls last year. She was a Black girl. And her mom told me, "You know the first thing she said was, 'I have three Black ... I have three instructors that look like me.'" And I [was] just like, "That's why you have to do it", because some... you know like, you know my brother and sister was engineers. So, I knew, I knew that was possible. So, that's never like been like a thing. But some, they never know. They don't know you exist.

For Aliyah, Devon, and several other participants, community service allowed them to give of themselves to help other people, which aligned with their spiritual values.

Connecting to future communities. Black women in the study not only discussed serving their existing communities, but they also talked about investing in their future communities. Nadia shared that she felt purposed to write children's books to get young people interested in STEM fields.

> I believe my life purpose is to help younger people…But what I want to do is write these children's books that have to do with encouraging people to get into science, specifically kids, so that's what I believe my purpose is. It might change, but that's really what gets me excited…I don't want to die before I do that. If I have one thing to do, I want to make

> sure I do it as soon as possible in case something happened to me. I want to leave that on the earth.

Nadia viewed writing children's books as a way to have a lasting legacy. She believed that helping others, specifically, children was indelibly connected to her life purpose. Although not every participant was as clear about their life purpose as Nadia, several mentioned believing they were destined to help others in their futures. Devon said,

> I think I'm still trying to figure out what my purpose is. I don't quite know yet. I know I still want to help people but I don't necessarily see that being within the products that I make throughout engineering. And so maybe using my platform or my status, wherever I'm at, to then bring up people behind me is more so what I see…maybe I can begin to create these programs who focus on minority women or minorities and help put things in place to help bring people up as I come up.

Though still unsure of where the journey would take her, Devon knew that helping others would be key to achieving her purpose. Similar to Nadia, Devon wanted to leave a lasting impact by bringing other underrepresented populations into STEM fields. For many participants, serving others was innately a part of their spirituality. From childhood to their imagined futures, other people were implicated in participants' spiritual lives.

Growing through the support of others. Participants also discussed how their relationships with other people helped them in their journeys toward becoming who they were meant to be. Often, participants shared how their family members provided them with the encouragement they needed to pursue their doctorates and persist in spite of challenges. Celeste recalled how as a young child her great grandmother would call her "my little Ph.D." Without

even fully comprehending what it meant at the time, her great grandmother's affirmation stayed with Celeste.

> Well, being the first in my family to get a Ph.D. is pretty special. It's weird, my great grandmother, out of all the grandkids, when I was maybe like three, maybe four, I sat on her lap and she was like, "My little Ph.D." My family, they didn't know what that meant or why she called me that. Out of everyone, she called me that. It was almost like prophesying over my life, 'cause I never saw myself getting a Ph.D. I didn't even think something like that would be attainable.

As Celeste quickly approached graduation, she believed her great grandmother's words were prophetic. Before Celeste knew what a Ph.D. was, her great-grandmother helped set her life on a path that Celeste was preparing to live out.

Devon also talked about how her family kept her encouraged as she navigated her engineering doctoral experience. She stated,

> Mostly through like prayer and like a lot of encouragement from a lot of other people, like so those people who, you know, just think the highest of you. And so even like in your darkest moments, they're still able to tell you like, no, you, you know, you're a great student. Like you can do anything. Like even though they're naive to the situation that [you] should go into like, just having some, you know, just hearing that, um, is able to like uplift your spirits a little bit. And keep you going and just knowing like, you know who I guess I'm kind of doing it for. Like, it's not just for me, you know, my family, a lot of people are counting on me looking up to me to finish this program.

Despite not always understanding the challenges Devon faced in her doctoral program, Devon's family members were her biggest cheerleaders, affirming that she could and would finish what

she started. Devon's family's confidence in and support of her helped her stay uplifted while in pursuit of her goals.

Finally, Black women in the study talked about how they felt deeply connected with their ancestral communities and how those relationships motivated them to achieve their aspirations. Taryn shared that her grandmother and her other ancestors' prayers were what helped her remain encouraged.

> I think back to my grandma and she was the most powerful woman, like spiritual woman that I've ever known. And I feel like the reasons that we are here are because of [our ancestors'] prayers. So, like we're standing on the shoulders of giants literally and we just gotta keep pushing through.

Taryn's comments reveal the significance of relationships with others, both living and deceased, in her spirituality. She believed that the prayers of her ancestors contributed to her ability to be where she is today, and they also kept her pushing toward her future.

Summarily, Black women in the study articulated three interconnected aspects of their spirituality: 1) belief in and relationship with a higher power (e.g., God); 3) understanding and development of self; and 3) accountability in relationships and interactions with other people. The interplay of these three aspects illuminates the complexity of Black women's conceptualizations of their spirituality and begins to shed light on the various ways Black women operationalize their spirituality.

Black Women's Enactment of Spirituality

Just as these Black women's conceptualizations of spirituality center the importance of higher powers, self, and others, so does their enactment of spirituality. Because Black women in the study possessed such robust understandings of spirituality, their expressions of faith were

intrapersonal (that is, related to self), interpersonal (i.e., related to others), and transcendent (relating to higher powers). For example, when asked how they express their spirituality, participants in the study provided various responses including remaining attuned to their holistic well-being (e.g., physical, emotional, and mental health), engaging with communities of faith, and communicating with God. Moreover, participants offered myriad responses to interview questions about when and where spiritual moments occurred in their lives, because such moments were less about the actual events and places, but more so about their meaning making about them from a spiritual perspective. These women also spoke of being able to tap into their spirituality whether they were alone or in the company of other people, but being especially aware of their spirituality in challenging times. For the Black women in this study, their spirituality was all-encompassing and deeply significant in how they chose to live and operate in the world.

How Black Women Express their Spirituality

When asked how they express their spirituality, participants' immediate responses often denoted particular practices and routines they associated with their spirituality such as praying, reading religious texts, and attending church. However, when I probed further about why these acts and behaviors were meaningful, participants shared that they helped guide their decision making, behaviors, and treatment of others.

Prayer, Scripture, and Community. Through prayer, studying scriptures, and connecting with other members of their faith, participants were learning how to live out their faith practically. For example, Harmony shared that her spirituality permeated every aspect of her life, and that engaging in behaviors such as being in community with other believers or reading the Bible helped define her character and day-to-day actions.

> I don't know, [my faith] kind of permeates everything. I guess like some of the obvious… like I go to church every Sunday, or there's like a small group that my church has that I go weekly, like be in community with believers and different things like that, but I think also, it's just perspectives of things, like reading the Word and trying to act out the way that God has called us to be, like being more loving to people, looking out for people who are marginalized or alone, and trying to show them love in ways that other people haven't, or being more patient with people that you're not used to, or loving on people who are actually being mean to you. It's like, there are obvious things but then there's also, I guess, smaller, just character things that I try and do to act out my faith.

For Harmony attending church services, spiritual small groups, and reading the Bible were all ways for her to gain a deeper understanding of her faith and how it should inform her daily life. Showing others love, being kind, or exercising patience were all expressions of her spirituality as guided by practices and routines emblematic of her religious upbringing.

Several other participants shared how engaging in practices such as praying, reading religious text, or connecting with spiritual communities influenced their thoughts and actions. For instance, Shanice stated,

> Along with spirituality I think of prayer, taking time to read the Bible, study the Bible kind of build myself up because I guess having that knowledge will kind of influence the decisions I make or the way I think, or the way I treat myself and treat others. I think, yeah, prayer and just kind of building my relationship with God and building that discipline also has an influence on the soul as well.

Shanice's comments highlight how practices such as praying and reading the Bible were ways that she equipped herself with spiritual knowledge and developed a stronger relationship with

God in order to live in accordance with her faith. Comparably, Devon shared how attending Bible study provided access to other believers with whom she could relate and have candid conversations about difficult topics from a spiritual perspective.

> We have Bible study on campus and then I go there and that's just like, I find it really, really comforting to just come together with people who are young and like-minded. And then we have real conversations discussing real topics and then how to come in terms or how to come at those problems or those real topics from a mindset of what would Christ do, or like how can we be progressing to being more of the person that God would want us to be in those difficult topics.

Devon's Bible study group provided her with the space to process and discuss practical applications of scripture to present-day issues with others. With this group, Devon could exchange ideas and strategies for living out biblical principles and remaining aligned with the will of God.

Worship. Another expression of spirituality that participants discussed was worship. Worship was a way for participants to glorify and commune with God. Thus, it could take a variety of forms. For Harmony, playing music was an act of worship that brought her closer to God. In a journal entry she wrote,

> Music just has a way of invoking emotions and feeling that simply cannot be expressed in words. Also, I love using the gifts God has given me to glorify Him. And I feel like this is easily shown in worship. There's also just this feeling that you're literally at the arms or at the feet of God Himself. Like you're communing with heaven whenever you worship.

As a musician and songwriter, music was a natural way for Harmony to convey her love for God. However, she acknowledged that worship could look vastly different for others.

> I feel like worship isn't specifically in a box of you have to sing, like musical. You can worship by running or dancing or—I just so happened to have been doing music since a wee child. And so, that's just kind of, I think, how I connect with it.

Other participants also described engaging in worship through music, even if it was through listening rather than playing it. Serenity shared how throughout her life she heard the sounds of gospel music playing in her grandmother's home. She also remembered sitting alongside her grandmother singing in the church choir as a child. As Serenity grew older and matured spiritually, the songs she memorized in childhood began to take on new meaning. Describing the lyrics of a song that especially resonated with her, Serenity said,

> And so, the title is "I Do Worship", and I think it's just like saying that, I do—like, I can, I do, this is what I do. This is kind of who I am type, I mean kind of repeating that because it's really just all they really say over and over. But, it's just kind of saying that I do, and it puts me in a mind state like, yes, I know I am a child of God.

Listening to that particular song reminded Serenity that she had a relationship with God that was her own. As Serenity heard or sang along with the lyrics she was affirming her identity as a worshipper and child of God. Similarly, Cadence spoke of when she was in church clapping and singing along with the music, she was able to quiet her mind and focus on God. Describing how she felt after spending time in worship, Cadence said, "Emotionally I feel freer. Spiritually I feel rejuvenated. Physically I feel lighter, like I actually feel lighter just being there."

Hearing from God. Black women in the study also discussed how as they engaged in spiritual practices, such as prayer, communing with other believers, or worshipping they were able to hear directly from God. Sharing how God answered her prayers when Shanice faced a potential setback to her graduation timeline, Shanice said,

> So, the first thing I thought to do was pray and just get that guidance from God sort of aligned, whoever I'm supposed to cross paths with, whoever is supposed to help me, whoever is supposed to be in my corner; I just wanted to kind of set that foundation to kind of bring all that together…All of a sudden, I just hear, "I'll make the crooked path straight." And that for me is referencing another Scripture that is in direct application to what I need to happen like, quick. It was just that still, small voice that I'm used to hearing and it was just plain and simple. It was clear and it was directly in line with His words, with the Bible, and what I've come to believe and hope for, and trust in.

Shanice's hearing from God was directly tied to the spiritual practices she engaged in regularly. As she prayed, she was reminded of a verse in the Bible that applied to her current predicament. Moreover, Shanice's attribution of the voice she heard to God was due to its alignment with scripture, upon which her faith rested. Ultimately, after hearing that particular message from God, Shanice met with one of her dissertation committee members and resolved the misunderstanding concerning the timeline for completing her doctorate. The crooked path was indeed made straight as Shanice did not have to navigate the alternative routes to finishing her degree as she anticipated, but rather was able to remain on track.

Participants also described hearing from God through signs, visions, other people, as well as subconscious thought. Asked how she hears from God, Celeste responded,

> Various ways. It could be through another person, another being, another entity. I guess for me to describe it, it's not like a voice I hear, it's almost in my subconscious. Because for me, God is within me. So, you know how you have your thoughts, you have your intuition. I feel like sometimes that's God. Then I feel like sometimes interactions I have with other people is nothing but God. The people I meet on a daily basis, I'm like, "Well,

why did we even meet, what was our purpose of crossing?" But I know it's God. He's communicating to me, like maybe you should know this person for some reason it could be so small or minute, it could be huge. So, I think He communicates in different ways and they're all over the spectrum.

Like Celeste, several participants in the study said that they heard from God in various ways, and how with time they were able to discern the voice of God. For example, Shanice also stated that received messages from God through different mediums, but it was important for her to know when it was God speaking as opposed to herself, and even the devil.

I used to joke, saying, "Sometimes I need the Lord to sound like Bernie Mac. Like, '[Shanice], you know you need to do so and so. What you doing girl?'" Real clear. So that there's no mistake, and I can't talk myself out of it…But usually for me it's…sometimes it'll sound like my own conscience, like my own inner voice. Sometimes, I was also joking, either Bernie Mac or what's his name, James Earl Jones, the voice of Mufasa? Yeah, so sometimes it'll sound like James Earl Jones. But for me, it's a strong, but still small voice. Sometimes it'll be a vision, sometimes it'll be like an urge or an unction. So, I think, the level of my spirituality that I'm in is being able to distinguish and recognize the Lord versus my own flesh versus the devil, because he's a spirit too. And so, that's what my mom, we were talking about that maybe a couple days ago. She was saying you know, you got to be able to discern and distinguish between the three.

Although the voice of God did not always have the rich baritone sound of actor James Earl Jones, or the direct, humorous delivery of comedian Bernie Mac, Shanice knew when she heard from God. Further, in attuning herself to God's voice, she was able to act upon it accordingly.

Shanice and Celeste's comments illuminate how direct communication with and from higher powers influenced these Black women's expressions of their spirituality by guiding their thoughts, feelings, and behaviors. When Shanice heard from God about her dissertation timeline, she was able to rest in the assurance that everything would be alright. For Celeste, every encounter she had with another person was an opportunity for God to fulfill a particular purpose. Other participants described their spirituality leading them to make certain decisions, such as Parker who chose to pursue graduate study after hearing clearly from God.

> So, my thing is I feel like when I pray, I want to make sure, and I mean Jesus telling me, "For real, this is what I want you to do," before I actually make the actual decision. I'm that kind of person, which I guess [for] other people, it's probably easier, but I'm one of those who's like, "Yeah, go. I told you to go," with a physical push.

When it came to major life decisions, Parker trusted that God would give her the answer she needed to move forward, albeit sometimes more assertively. For Black women in the study, hearing from God provided clarity and direction as to how they might exercise their faith.

When Black Women Express their Spirituality

Participants in the study also offered insights on when they express their spirituality. As the previous section suggests, participants engaged in spiritual practices in their everyday lives. For instance, participants mentioned praying throughout their day, as this was a way for them to communicate with God on a continual basis. However, participants also discussed being especially attuned to their spirituality during difficult times in their lives.

In everyday life. Black women in the study frequently mentioned praying, attending weekly church services, or spending time reading religious texts or materials as a part of their regular spiritual activities. While there may have been times when participants were unable to

engage in these practices as consistently or often as they may have wished, these acts were still fairly routine. For instance, Celeste described reading devotionals daily and praying anytime she felt inclined throughout the day.

> I have a devotional book that I read every morning. It includes like an inspirational passage, it has my scripture and a scripture reference. It's definitely just to uplift you for the day. I do that every single morning. That's pretty much routine. Then of course, I pray throughout the day, too. Anytime.

For Celeste, reading those devotionals and communicating with God through prayer daily kept her encouraged. When asked what her prayers were about, Celeste shared that she would talk with God about anything that came to mind.

> I might have a short prayer, it could be a thankful prayer like, "Thank you, Lord, you brought me through this little step and I didn't even ask." It could be like, "Please, just get me through today because I have this and this going on." It could be just thankful for waking my family up, waking my friends up. Having a core group of people that support me in all that I do. Some of them are long, it could be literally anywhere. I could be in the shower. My prayer life is very just diverse. It just depends.

Prayer was an integral part of Celeste's spiritual life. She felt it was important to pray regularly because it was her way of touching base with God. "Prayer is when we communicate with God. It's like you said, every day, touching base. That's our communication." Taryn had a similar philosophy of prayer.

> I mean, I guess prayer is anytime you just be like, "So God, how you doing?" That's a prayer right there. And we just talk…and it varies, but I don't believe prayer has to be like formal where you're on your knees and you're like, "Heavenly Father... blah-blah-

> blah...” It’s how you vibe, you know? So, I guess, yeah, it could be just like walking around, “Thanks...” you know, whatever. So, I guess sometimes it’s just once a day, but it also varies, you know.

As Celeste and Taryn expressed, for many participants prayer was an ongoing conversation with God that could happen anytime and anywhere. Additionally, spiritual practices such as reading religious materials or attending church were also typical aspects of participants spiritual lives. Engaging in these practices regularly helped keep participants attuned to their spirituality and feeling closely connected with God. In the words of Aliyah, “I think just being able to acknowledge God and see Him throughout my day is consistent.”

In times of trouble. Aside from during their more routine spiritual practices, participants also mentioned being especially aware of their spirituality during difficult times in their lives and specifically, during their doctoral programs. For example, during Lailah’s doctoral program in engineering she experienced a severe bout of depression. However, her faith was what helped her through that challenging period.

> I know that spirituality helps me in the tough times, because I know, for example, when I had depression— suicide thoughts— the only thing that prevented me from doing stuff is God. Because now that you know that He’s there. So, it’s always a sense of hope.

The presence of God gave Lailah the encouragement to continue living. When Lailah was at her lowest point, a recurring thought was that there was no hope, but then she remembered that her hope rested in God and not the world.

> So, when I was not believing, I think what I heard the most is there is no hope. There is not hope that things are going to get better. Because I don’t have hope this world’s going to get better. I think things might be getting better in some ways with time, but then

there's too many other ways, and I don't think they will ever get better. Because I still think, even in a good system, we have corrupt people…So, I don't hope in this earth, but I hope in the future. So, I think that's where spirituality comes in.

Although Lailah still maintained a healthy skepticism of the world, her faith helped her believe that a brighter future was possible.

Amaani also described how she leaned on God during an especially trying time in her doctoral program. Though her spirituality was not where she wanted it to be then, she remembered praying that God would help her.

> I mean, I had considered like, "Okay, what if I just quit? What if I just cut my losses, quit grad school, do something else?" And I mean, it took so much... I had to believe in myself to a certain extent. I've always had imposter syndrome. I still have imposter syndrome. And at that moment when I was going through that, I was like, "Wow. Maybe I don't belong here." So, I just had to trust I have to make it through…Man, I prayed so much during that time even though my relationship with God wasn't really great. I was like, "God, please help me." I'd be doing experiments and be like, "God, please let this experiment and this data come out." Yeah. Then slowly things started picking up, and things are going pretty okay right now. I feel like I have to thank God for that, every milestone, every small victory.

Despite feeling her relationship with God was not at its strongest at the time, Amaani still had faith that God would see her through. As she began to make progress, Amaani credited God for her success. Reflecting on her graduate experience, thus far, Amaani remarked that her spirituality keeps her grounded in times of uncertainty.

> I feel like spirituality means everything that I do in the context of grad school, like my research, I feel like all of it is tied to God and trusting Him because, I mean, grad school has been the most uncertain thing I have gone through in my life. And I feel better when I feel like my spirituality is in check. Meaning when I feel like I am being watched over and taken care of by a greater being, then I feel like if things are not going great right now, that's fine because I'm not in control. God's in control. Versus when I've been in a place where that was missing from my life, when things were not going well, it was like nothing's going well, and I'm still not in control.

Amaani's faith that God was in control gave her a sense of reassurance and confidence. Knowing that she was watched over and cared for in the midst of it all, helped her relinquish the need for control in her life and allowed her to trust that God had a plan.

Like Amaani and Lailah, Michaela had faith that in challenging times God was there. According to Michaela, even when she could not always feel God's presence, she knew God was with her.

> There're always challenges. I don't know if I will call it challenges of my faith because it was never a time when I felt that God wasn't there or that He didn't have the infinite power to—He's omnipresent and omniscient, there's never a time where I was like, no…He's not there. But I think just being human, sometimes you pray and you feel like, "Maybe you could respond a little bit…" because I think we always want like this mountaintop experience where we feel like we're so closely connected. And I think sometimes just the part of [being] human, you don't always feel His presence. You don't always feel like He's right there with you. Sometimes you just feel—not so much alone, but you may be feeling like there's a delayed response or sometimes you feel like, "I got

> to go back and pray about this again." He's heard you the first time and He's capable to respond and He's going to respond…

Michaela's comments highlight how there may be moments when participants may not feel as close to God, but they believe that God is listening and will answer in due time. Other participants similarly described having times of distance from God, but still relying on their spirituality in times of trouble.

Where Black Women Express their Spirituality

Black women in the study also shared that where they outwardly expressed their spirituality varied. When asked where they felt the most spiritual, or at least most comfortable openly expressing their spirituality, some participants described feeling particularly drawn to spiritual spaces such as churches or bible study meet ups, while others were more comfortable expressing their spirituality in private. Notably, participants rarely mentioned expressing their spirituality in their academic environments.

Spiritual Spaces. Multiple participants identified places of worship (e.g., churches) or environments shared with other people of faith (e.g., bible study groups) as spaces where they felt the most spiritual. Typically, what made these spaces spiritually edifying for participants was the people they encountered there. Cadence spoke of how attending church allowed her to be in community with likeminded believers who also desired to worship God.

> Here it's like we're all of one mind. We're all in one accord, so we're all there for the exact same reason and that's just to worship God and it's really nice. It's nice being around people with the same goal…I guess not goal, more like purpose, and that purpose being just to worship.

Shanice similarly noted the importance of the people she attended church with. Witnessing others readily tapping into their spirituality and immersing themselves into the service was inspirational for her.

> I feel the most spiritual [at church] because it's just that feeling that I get when I walk in. It's the environment, it's the other people. For instance, if I've had like a rough week or if I haven't been as diligent with reading the word, prayer—but then I get around folks who seem to be on point with it and they ready, they at church, they ready—it doesn't take them long to tap in and it influences how spiritual I feel. Like sometimes as a reminder, yeah, I can be as expressive and just open and I don't have to feel ashamed in a sense. And I can—their energy helps influence me as well, so definitely at church. Sometimes I'll feel like, I'll need to go, but once I get there it's like, yeah, I needed this, I need to come.

Shanice's fellow congregants were role models for her in terms of how freely they worshipped. She also noted how being in church made her feel. Shanice described being energized in that space as she praised God alongside other believers and how she "needed" to be there. However, in a later interview, Shanice amended her previous comments saying that church is no longer where she feels most spiritual.

> For me, sometimes I feel as though church might not be the area or the place where I feel most spiritual, because sometimes I'm focused on who's watching me, or what did I do all week, how do I feel right now. I'm worried about so many other things that might interrupt or keep me from maybe tapping into the service, or tapping into God's presence. Then not being able to tap in creates problems. So, it just kind of compounds from there.

When Shanice felt mentally preoccupied she found it difficult to feel connected to the presence of God. Additionally, depending on her state of mind, the people who once helped her become more attuned to her spirituality, could be sources of distraction as she wondered what they may be thinking of her. Shanice views about church changed after seeing the ways church members criticized and gossiped about her sister when she was experiencing a challenging period in her life.

> Sometimes, church can be the source of some of the most difficult times in people's lives. Has that really happened to me? Not necessarily, but the folks that I'm connected to, it associates me with that drama. I've moved from different churches, just searching for one where I felt comfortable, one where most of that drama and negativity, at least I'm not involved in it. No matter where you go, it's probably going to be something. Yeah, that's why for me, at first, I was like, oh, in church. Then I really thought about it, and I was like, no, not church.

While Shanice had hoped that her sister's fellow congregants would be supportive and loving her time of need, Shanice was disappointed to see how judgmental they were. Although Shanice did not directly experience ostracization from the church, what happened to her sister altered her perspective on where she felt most comfortable expressing her spirituality, which gravitated her more toward private spaces to express her faith.

In private. Other participants mentioned preferring private spaces to express their spirituality to avoid distraction and judgement. For example, Amaani shared that being in her room when she was alone was one of the places where she felt most spiritual.

> I feel like I know that I can talk to God anywhere, you know? He doesn't require being in your best church attire and going to church. I know that but, I feel like my mind is always

> racing thinking about lots of different things that it's hard for me to get into the mental space to just talk to God if I'm in a place that I'm not totally comfortable or if I'm somewhere that's really distracting you know? I feel like if I'm just at home in my room by myself I can pray much more easily than if I'm walking somewhere outside or somewhere else.

Similar to Amaani, multiple participants described seeking out private spaces where they could clear their minds and focus on God. Some found that they could easily tap into their spirituality when they were in their cars, others felt more spiritual in their living rooms, or kitchens. What made these different spaces conducive for participants' spiritual expression was the privacy and comfort of these environments. Participants also mentioned feeling spiritual in their academic environments, but usually when they were alone.

Elaborating on how her room differed from her lab space, Amaani stated that when she is in her research environment during typical work hours she can easily get consumed with her work, but if she happened to be in the same space over the weekend by herself she felt completely different.

> Yeah, so when I'm in lab, I don't know, I feel like when I'm in lab I'm in such a mode of, "Get these experiments done, plan for these experiments," I'm in a work mode. There have been times, not recently but, there have been times when I stay in lab really late or I'm in my office really late over the weekend because I'm writing. There's not really anybody else around because it's a weekend or it's late, so I feel like in those moments I feel it's similar to when I'm in my room. If I'm in my office and I've been there for hours and I've got my blanket and I'm just writing away and no one else is really there, I feel like it's very similar to when I'm in my room because I feel like I'm alone and I feel like

> I can talk to God in those moments very easily. But on the day to day it's like a 9:00 to 5:00 and there's other people there and I feel in my specific mindset so, yeah.

In those quiet moments over the weekend, Amaani felt it was easier to communicate with God or feel more spiritual as opposed to when she was in the company of her lab mates who may be focused on experiments and productivity. Comparably, Cadence found a private corner in her engineering building, away from her office, where she could communicate with God at her leisure.

> Actually yeah, it's actually the perfect spot to pray because there's—it's less of a conversation...well, I guess no. It's still a conversation, but a longer conversation because I give myself the time there. It's not like I have a bajillion other things to do. It's not like I'm by my desk and I have all my work spread out in front of me. No, usually I walk there and it's just me. Yeah, it's just me so I have all the time. It feels like I have all the time in the world just to pray and just think and just be.

When asked how her office felt different from her special spot in the engineering building, Cadence said, "I feel not free, so still myself, but like a caged version of myself, I guess." Amaani's and Cadence's comments illuminate how participants' academic spaces could be sites of stress, but also potentially conducive for spirituality when they are alone and feel at ease to commune with God.

Another participant specifically spoke of the freedom she felt expressing her spirituality in her engineering environment privately, but how constrained she felt in the company of her peers and faculty. In a journal entry, Maya wrote,

> The student lounge is a place that students, faculty and staff frequent during the workweek. However, my favorite time to visit this location is during the weekends. The

> large windows provide sunlight that energize me, making the lounge the ideal location to complete homework during the winter months. The presence of bright sunshine and the unusual quietness/solitude during the weekends makes all the difference. I feel the most comfortable talking about my spirituality in the student lounge during the weekends. I recall engaging in phone conversations with some of my spiritual mentors…in this lounge. If it was a typical weekday, however, I would not feel comfortable talking about my spirituality here. There is a particular part of me that feels "free," and at ease during the weekends; I feel no need to hide my true self when peers and faculty members are not around.

Asked to elaborate on why she felt the need to hide in her academic environment in the presence of her peers and faculty, Maya responded,

> I just don't feel a part of the department, maybe culturally, and there's been a lot of passive aggressiveness between students, which is not part of my culture at all. People are very unified and supportive, friendly, at least where I came from... I feel like when I'm around a lot of students and a lot of faculty that I see have judged me or hurt me or hurt other people, I don't feel comfortable, versus during the weekend. It's like I'm there by myself, I can just enjoy working.

Maya's statements highlight how some participants' comfort expressing their spirituality in a particular space can shift in the company of academic colleagues. Moreover, Maya's vastly different perceptions of the student lounge during the week versus the weekend demonstrates how others may inhibit Black women's spiritual expression, especially if those people are perceived to act incongruously with participants' spiritual values.

With Whom Black Women Express their Spirituality

Although multiple participants discussed expressing their spirituality privately, they also mentioned other people that they would feel comfortable engaging their spirituality with. Often, participants referred to family members and close friends as people with whom they could express their spirituality. Conversely, in academic contexts, participants were less likely to discuss or express their spirituality with engineering colleagues, unless they had developed close relationships with these individuals.

Family and friends. Black women in the study frequently named close family members as people whose spirituality they desired to emulate. Shanice, for example, greatly admired her mother's faith and whenever she spoke with her mother she could expect to receive a word of encouragement, a scriptural reference, and prayer.

> My mom, she always has a scripture, a word, words of encouragement. Even sometimes I talk with her, I feel convicted like oh because she'll either be praying for me, or telling me something that she had been reading or learning. And it will be a direct or have a direct application to my situation, a direct application to decisions I've made or ways I have messed up. She don't know, but it's like you're just talking to her and, even if I'm going through something, she's ready to pray, she got scriptures ready for me. I usually, whenever we're on the phone we're usually on the phone for about at least like 20 minutes to an hour. I usually will have a pen and paper because I need to write down things that she says. Yeah, definitely my mom.

Relatedly, Celeste noted her grandmother and mother as strong spiritual influences and how being around them inspired her to strengthen her own faith.

> I come from a praying grandmother. Like every morning, she's up doing her devotion, she's praying. Same with my mother. She even has a sign on her door that says, "Prayer

> in progress", so that means do not disturb. When I see that, even as a kid, it showed me like, "Okay, this is very important." It almost became a routine for me, too. Not quite as much as theirs though, 'cause they can be in there for a while. I'm getting there. They're very, very religious. My grandmother goes to about maybe three or four Bible studies a week. Some are at the church, and then they'll host some at their home. It's important in our family. It's pretty huge. Of course, that's gonna rub off on you completely, that's what's happened. Which is a blessing, because to be honest with you, I wonder about people that aren't raised in Christian households, what would make them want to be a Christian, or practice religion? Which would you select, and why? For me, I've never had to question, doubt, 'cause I have my own personal relationship and I know exactly why I believe what I believe.

Similar to Shanice and Celeste, other participants spoke of immediate family members who modeled spiritual living and helped Black women develop their own spirituality. Participants often learned how to express their spirituality from observing their family members, such as Celeste learning the importance of prayer at a young age from her mother and grandmother.

Aside from family members, participants also learned how to express their spirituality from close friends. For example, Kala shared how her best friend from high school was one of her greatest spiritual role models.

> My family's taught me spirituality stuff as well, but like not as much as I have acquired from my friends. Whenever I say that, I'm thinking about one friend in particular…She just became my best friend, and just seeing how [she] was so accepting of people, and loving and giving and helpful. I realize I've never talked about her in this capacity. Seeing how [she] lived her life so free allows me to—where I might not be able to do

> things, I can live vicariously through her as well as learn from them and make application in my own life. That's how [she] taught me about scripture.

While talking about her best friend, Kala became visibly emotional. She realized that she had never fully articulated what a profound impact her friend had on her spiritual life. From her best friend, Kala learned what it meant to express her spirituality in her daily interactions with others. Amaani also discussed how one of her closest friends challenged her to really examine her spirituality and overcome obstacles in her faith.

> I feel like in conversation with [my friend] is another place I feel very spiritual because, I don't know, it's really rare for me to have such a close friend like that, that we've been friends for so long to be able to talk about our spirituality. I have made friends in church here, but it's different being able to talk about that with somebody that I feel like we know each other more deeply. I feel like she's one of the few people who knows my true personality, really knows my true personality…I feel like she challenges me, because I know that if we're going to have a conversation spirituality going to come up, so I feel like if I'm not in a good place with God it's going to come up. I feel like it forces me to confront those seasons in my life where the spiritual, I guess, hurdles that I have to get over.

As a result of the close relationship Amaani and her best friend developed, the could have honest conversations about their spirituality. Those conversations were especially beneficial for Amaani, in helping her identify and address areas where she could strengthen her faith with the support of a trusted friend.

Academic colleagues, rarely. While participants could typically find friends and family members with whom they could comfortably express their spirituality, it was more difficult to

establish similar relationships in their academic environments. Though there were certainly exceptions, the majority of participants rarely disclosed or discussed their spirituality with their engineering peers and faculty. Serenity, for instance, had developed a strong mentoring relationship with a professor from her undergraduate institution, but felt that expressing her spirituality with her mentor would be outside the bounds of their relationship. Serenity, stated,

> She's a White, Ph.D., [STEM] professor. I feel like I have to stay professional with her. I feel like bringing a spiritual aspect is too much. Even though she knows where I come from and small personal details, but I feel like with spirituality and religion, that's too far. I also couldn't talk to her about politics. Same thing. I feel like, you shouldn't make assumptions, but if she was a Black female and she had given me the same opportunities and we had the same conversations, I might feel a little more comfortable initiating that conversation, but no one's initiated with me, so I don't personally feel comfortable initiating. Especially being someone who is the mentee, I don't want to mess that up. It's already hard enough to find a mentor, so I don't want to step on toes and make people uncomfortable. I personally never initiated those types of conversations.

Serenity's comments allude to a potential power dynamic with her mentor, noting that as the mentee, she did not want to jeopardize the relationship by initiating a conversation about spirituality since mentoring relationships were difficult to come by. However, Serenity speculated that if her mentor were a fellow Black woman, rather than a White person, she may have felt more at ease expressing her spirituality. Other participants in the study, specifically mentioned race as being a factor when determining their comfort level in expressing their spirituality with colleagues.

Taryn shared that she would be less likely to discuss her spirituality with her engineering lab mates unless she considered them to be her friends. She also added that the one person she could envision having a spiritual conversation with in her lab space was her lab mate who was also Black.

> Well I feel like when you're in a work environment type of place, it's kind of hard to organically get to that conversation. So, it's kinda hard when to bring it up, right? I guess the bottom line is, it just does not organically come along. So, we're out here trying to do research, we're all super focused, so most of the topics that are gonna come up are things related to research. But that being said, I guess with my lab mates, we do sometimes tend to talk about things that are not research related. However, it just depends on the lab mate that it is…As a whole group when we hang out together, I don't even think we've ever even ventured into spirituality as a whole group. But, individually with some people, yes. Because we're more than just lab mates, we're friends…So, one of my lab mates, he sits right next to me…So, he'll just start talking to me about random things. And religion will sneak up there, but we sit right next to each other, and we always talk...Plus, [he] is a brother so I'm like, "You understand the struggle, right?" So, I feel a little more open with him.

Taryn and Serenity's remarks suggest that Black women may be more inclined to express their spirituality with others who share their racial identity in academic spaces. As Taryn's stated, she would likely be more comfortable discussing her spirituality with someone who could "understand the struggle."

One participant described feeling perfectly at ease expressing her spirituality with her academic advisor in engineering. Celeste's advisor also happened to be Black, but when she met

with him initially she did not know his faith background. “He’s one of the only minorities in our department. I don’t know how or why, I just flocked to him. I didn’t know. I didn’t know that he was in ministry, or that he would have faith like that.” Yet, Celeste noted that her advisor continues to be one of her strongest spiritual influences. When she was deciding whether or not she would return to school to earn her Master’s in engineering, she came to her advisor’s office for guidance.

> My advisor, before I found out I was going to get a Master’s, and I got accepted, I came to his office crying. I was in his office, I was like, “I’m not gonna be able to do this. Am I gonna be able to keep the grades up? I don’t know what I’m doing.” He’s like, “Shut the door.” He’s like, “You need to go home and read the Book of Job.” That’s what I did. I went home, and I read the Book of Job, and I was like, “Oh my gosh. If Job can make it through, and he’s lost literally everything, I can do this too.” He’s been a very, very supportive advisor. He’s in ministry, so it’s like perfect.

Taking her advisor’s advice and reading the book of Job in the Bible gave Celeste the encouragement she needed to pursue graduate studies. Since that conversation with her advisor, Celeste continued to feel comfortable expressing her spirituality and discussing other non-academic topics during their meetings. Though Celeste’s experience with her academic advisor was uncommon, it does shed light on what holistic academic advising relationships could look like when spiritual expression is not avoided, but encouraged.

Summary

Black women in the study articulated multifaceted conceptualizations of their spirituality. When asked to define their spirituality, each of the participants expressed a clear belief in transcendent forces, or higher powers, most often referred to as God. However, their

understandings of spirituality did not stop there. Their spirituality also encompassed how they understood themselves and engaged with other people. Additionally, though most participants identified as Christians, the vast majority clearly distinguished their spirituality from religiosity. While several participants described religiosity as a strict adherence to rituals, doctrine, and practices associated with a particular belief system, participants' descriptions of spirituality focused more on the importance of developing healthy relationships between God, self, and other people.

Moreover, these Black women's expressions of spirituality occurred in a variety of ways, times, and places. Commonly though practices such as prayer, the reading of religious material, connecting with spiritual communities, and worshiping God, Black women in the study were able to further develop their spirituality and discover how to live out their faith. Participants also enacted their faith in their everyday lives. Yet, participants were likely to be especially attuned to their spirituality when confronted with challenges and difficult circumstances. Additionally, while some were more inclined to express their spirituality in places of worship (e.g., churches), several felt more at ease spiritually in private spaces, including academic settings if they were alone. Further, participants were most likely to express their spirituality in the company of trusted others, which could be family members, friends, or close engineering colleagues.

To conclude this chapter is a poem written to reflect some of the themes discussed, thus far. It is to be read as a love letter from study participants to God, highlighting the significance of this relationship in their conceptualizations of spirituality. Specifically, this piece highlights ways that these Black women expressed their spirituality as well as how they perceive and understand God in relation to themselves.

You see me as I am, was, and will be
You know me
The me I try to hide
Try to forget
Try to bury in the graveyard of time
But I can never escape your notice
Evade your watchful eye
Your tender gaze
Because you love me that much
Even when I feel unlovable

And when I am lost
Aimlessly wandering
Desperate for direction
Uncertain and filled with doubt
Alone and lonely
Vulnerable and afraid
You reveal yourself again
Remind me that you were always there
That I was protected and purposed all along
Never forsaken
Never abandoned
Just free
Free to explore and choose
Discover and challenge
Decide and discern
Stumble and fall
And ultimately find my way back into your arms

You are my respite and refuge
The peaceful place I return to again and again
My sacred space and healing home
You are where I lay my head
When I can't afford to be tired
Where I sit still and wait for revelation
You are the breath I take when no one is looking
The exhale after a long, hard day
You are where I find rest and lay down my guard

You make me feel beautiful
Because I know that I am a reflection of you
When I want to see your face
I stand in the mirror
Seeing you in me
In this body
In this skin

And that gives me strength
Courage to face a world that attempts to deny my divinity
and steal my power
But you say I am more
More than their limitations
More than their misconceptions
More than even I know
Chosen for such a time as this

You speak to me
Through loved ones
In signs and dreams
Your word and my intuition
You call me by name
As I call out to you
In prayer
In worship
Through dance and song
You hear as I speak
Listen, then answer

This is what your love is like
Patient, enduring, unconditional
It exposes and shields
Corrects and comforts
Arrests and delivers
And for all these things I am grateful
Because being loved by you is teaching me how to love me
So, I thank you
I rejoice in knowing you for myself
And learning more about you still
Keep leading and I will follow
For where better to be than where you are?

CHAPTER 5

Navigating Engineering Doctoral Programs

Portrait of Aliyah

Gently easing the door open, a standing-room only crowd gradually came into view. Aliyah's dissertation defense was underway and I barely squeezed inside. Taking my cue from others, I found a spot on the floor where I sat cross-legged as Aliyah gracefully moved from one slide to the next, explicating the findings of her research with confidence. Her audience—a diverse array of faculty, students, family members, and friends—listened as if transfixed, while models and simulations danced on the screen. Though Aliyah's research was clearly complex and immensely difficult, Aliyah's smooth, honeyed delivery coupled with her penchant for teaching made her work feel accessible and engaging. At the end of her talk, Aliyah concluded her presentation by thanking God and dedicating a loving photo tribute to her village—the community members who helped her reach this point—after which the crowd erupted in applause. Leaving the room while the committee deliberated, I thought Aliyah looked resplendent—beaming as she greeted well-wishers eager to congratulate the Doctor-to-be.

Nearly one month later, I was excited to see Aliyah again for our next conversation. Fondly remembering her dissertation defense and curious how she felt as a newly minted Ph.D., I

was surprised to hear Aliyah's reflections about that day. After the public audience was dismissed, Aliyah's family members and friends, along with another committee member, who attended the event via livestream were still online as the committee discussed Aliyah's dissertation. Aliyah's loved ones later relayed to her the disparaging comments they overheard from her advisor.

> Everyone was just like, "Oh, it was so great", one of the best defenses they've seen—like, all this great stuff. Then [my advisor] comes in…almost as if he was trying to convince them to fail me or to change their revision and he was like, I don't give him credit and he said all of this was his idea...He said he was surprised the defense went so well because he thought it was gonna be a train wreck…My thing was that if you did not think I was going to do well, as an advisor, why didn't you take the time or—you know? Something just—It's just like you don't want me to succeed.

Despite the remaining committee members' overwhelming support and ultimate decision to grant Aliyah her doctorate, her advisor's words were incredibly hurtful.

> The next day, I just cried and cried…I'm just like, I'm supposed to be happy and yet—you know? This has power over me, and then I realized—I came to the conclusion, I was like, regardless of what else I did there was nothing that's gonna change his opinion of me. Nothing. I coulda did the additional study he wanted me to do, I coulda wrote another thirty pages, you know? There's nothing that's gonna change his—that's what he thinks of me and that's fine…

Although her advisor's comments stung, Aliyah believed that it was not her responsibility to convince him that she was deserving of her doctorate, particularly if he was determined to

undermine her accomplishments. Further, she refused to give her advisor credit for what she believed should be attributed to God:

> I think people can also see for themselves and I have other people who support me and support my professional development in a way that'll help me move forward and I don't need him. It's really just like, God is only using you, like you not even—you want all this credit but the credit is not for you, it's to God, and I'm not gonna give you God's credit.

Aliyah's faith encouraged her to believe in herself and her capabilities, in spite of her advisor's actions throughout their tenure together. Recalling those experiences, Aliyah mentioned how at times she would be expected to complete tasks that were outside the scope of her research. She argued that if she were a man, she would not have been asked to perform some of the invisible labor her advisor casually requested. Aliyah's research required the involvement of research participants in the testing and development of technology that could be used in the medical industry. So, when a prototype of a garment participants would wear for the study needed to be developed, rather than hiring someone to create it, Aliyah's advisor asked if she knew how to sew and expected her to do it. Though outside of her research responsibilities, Aliyah would also do some of the technologists' work, including fitting the garment to participants. However, if she believed that what was being asked of her would be uncomfortable or unreasonable for her study participants, she drew the line.

> I feel like, at least me as an engineer, if it's something that doesn't sit right with me, I'm not going to do it…If I was a male graduate student, I wouldn't be doing any of that shit. You would've had to pay someone to do it.

When Aliyah disagreed with a decision being made or a process that was suggested, she vocalized her opinions and pushed for what she believed was right, which was why she balked at her advisor's minimization of her research contributions after the defense.

> To hear him say—just basically devalue me and all the work I've done as if I'm just some, I guess lab rat, that he tells what to do and I just do it. I'm like, no, I don't do that, which is why we have so many issues.

Aliyah's experience throughout her doctoral program taught her a valuable life lesson. Aliyah realized her earning her advisor's approval was not the goal; being respected mattered more.

> I think the main [lesson] that has been like my mantra: It's better to be respected than liked. And I think for the longest I was so focused on ... I just want everyone to like me. I want my advisors to like me. So, it's like you're doing all this to please them to a certain extent. And then I realized, it doesn't matter what you do. You'll never please them. They're always going to want to suck everything they can, every good in you, out. All the work they can get out of you, out. They don't care about you as a person. And so, I think that's the main lessons I've learned these five years that it's better to be respected. And who cares if they like you; but at least they respect you.

Aliyah attributed this lesson to her spirituality. Immersing herself in scripture kept her fortified as she navigated her relationship with her advisor.

> The scripture says the Word is your sword. That's the only one thing you need, is the Word. And so, I just had to keep putting the Word inside of me subliminally—working, listening to scripture. Also, directly by going to Bible study. But I just had to continue. And then just tell myself, I'm enough and I deserve to be respected.

For Aliyah, the Bible reinforced messages that as a person, and more importantly, as a child of God she was worthy of respect. Additionally, Aliyah's scriptural reading and spirituality helped her separate people from the spirits operating within them. Aliyah believed that rather than combatting her advisor's affronts personally, she would do it spiritually, which is why she decided to publicly acknowledge God during her dissertation defense.

> And I also think, to me it also was just a way to just let the spirit within [my committee members] know that God is in control, and that whatever you're trying to accomplish will not work with me at least. But to really speak to that spirit inside of them. Because I know it's not them. It's their spirits inside of them…And that's why it was also so important to me to be like, I want to thank God for placing all of you. To say that.

Aliyah believed that people might possess spirits that could be addressed supernaturally. For example, the need to control or manipulate others could be a manifestation of a spirit within a person. Yet, Aliyah's spirituality empowered her to resist any attempts by her advisor, or anyone else, to control her. Though perhaps overlooked by other attendees at Aliyah's defense, her decision to publicly thank God during her presentation was a declaration that God—not her advisor, or even her other committee members—deserved the credit for her achievements.

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Aliyah's story highlights the various challenges and assets Black women within the study utilize to navigate their engineering doctoral programs. Confronted with the challenge of working with an advisor that did not believe in her, Aliyah relied on her spirituality to help her engage in acts of resistance. Aliyah exercised agency by pushing back when she disagreed with her advisor's decisions regarding her research, especially if those decisions conflicted with her values and compromised her participants' needs in some way. She also made it a point to

attribute her achievements to God, rather than her advisor, or her committee members, as an assertion that only God deserved her praise. With faith, community, and tenacity Aliyah was able to persist and ultimately earn her doctorate, though not without struggle. In this chapter, I will expound on the challenges faced and assets leveraged as Black women in the study navigated their engineering doctoral program contexts. Further, I will elaborate on how participants engage in resistance, resilience, and transcendence.

Navigating the Tunnel: Black Women's Experiences in Engineering Doctoral Programs

For Black women in the study graduate school was a site of great challenge and formative spiritual development. At various stages in their programs, participants discussed the rigor of their graduate studies and research along with personal obstacles faced as they pursued their doctorates in engineering. Frequently, participants mentioned feeling a lack of belonging in their departments and schools as one of the few, or only, Black women in their programs. Even at historically Black institutions, there were participants who experienced difficulties as they studied in engineering departments predominantly comprised of international students and men. Participants also described struggling with self-doubt and insecurity as they battled imposter syndrome at different points of their graduate experiences. Additionally, graduate school presented mental health challenges for multiple participants struggling to balance academically demanding programs and difficult life circumstances simultaneously. Finally, participants contended with both subtle and overt forms of discrimination in their doctoral programs.

As demonstrated in Aliyah's portrait, working with an unsupportive advisor and negotiating power dynamics in research, took an emotional and mental toll on her. Participants also frequently spoke of searching for the "light in the tunnel" as they described this particular period of their lives. A telling metaphor for the doctoral experience, tunnels can be dark, cold,

uninviting spaces. This description could also be literal for participants such as Cadence whose engineering office space was located in a dim, windowless basement. Yet, if the promise of light was present, there was hope. For instance, when Amaani was facing complications with her research and battling feelings of imposter syndrome as a result, she described having a tunnel experience. Early in her doctoral program, she was working on an experiment and yielded promising results. Her advisor encouraged her to continue with the project in the hopes of working toward a publication, however, it turned out that the results were not reproducible. After that, Amaani's advisor seemed to lack confidence in her which caused her to doubt herself. Yet, what gave her hope were moments of validation and assurance that she was on the right track.

> When I was going through that phase where things weren't going well and I was depressed and all that I felt like I was stuck in the middle of a tunnel and I couldn't see either way out. The fact that now I—Even though I'm not at the end yet, and I still have a lot to do, I just feel like I will finish…I feel like God is giving me all these... like I'm following a path, and He's leaving crumbs of validation to the end just to remind me like, "Yes, you are you going to make it through. Yes, you do deserve to be here."

Trusting that God would lead her out of the tunnel helped Amaani regain her confidence. Whereas she earlier entered her lab meetings filled with anxiety, she later felt more secure in her capabilities. She also had faith that even if things were not going well in the immediate, they would be alright in the end. However, as was the case with several participants, there were still more challenges to overcome before seeing the light.

Relatedly, as Nadia neared the end of her doctoral program there were still obstacles to overcome, but she believed that God would allow her to reach her goal and finish her degree:

> So, my experience here has been [that] a lot of things didn't work out. But in terms of spirituality, I just believe that God put me here for a reason. He'll make a way. Even though I don't see a light at the end of tunnel, it's a walk of faith. That's basically my mantra for the rest of the semester. This is a walk of faith. Even though you can't really see the end, that's just what it's going to have to be."

Though Nadia could not necessarily see the light when we first met, she had faith that it would appear. Similar to Aliyah, Nadia had a trying relationship with her advisor and was fighting to make progress with her research in order to defend her dissertation as quickly as possible. Despite setbacks and disappointments, Nadia believed that there was a purpose in her pursuing her engineering doctorate at her current institution, and this encouraged her to keep pressing forward in the hope of reaching the light.

Challenges in the Tunnel

Though participants entered the study at various stages in their degree pursuits there were common challenges they noted when describing their doctoral program experiences. While any one of these challenges could derail a graduate student's progress, participants in the study often experienced multiple at any given time. I will elaborate on the prevalent challenges disclosed by participants in the sections that follow.

Lack of belonging. Several participants described feeling as if they did not belong in their engineering environments. Many participants attributed this feeling to being one of the few, or the only, Black women in their departments. Yet, for some, the lack of demographic representation was exacerbated by the sense that they were unwelcome. Though participants rarely experienced any explicit messages or blatant acts of disregard from peers and colleagues, they described an instinctive awareness that others believed they were not supposed to be in their

engineering departments and schools. For instance, when Amaani was visiting her department as a prospective student, she remembered striking up a conversation with another student guest. Noticing a Black man in the room, the student asked Amaani who the person was. She responded that he was notable scholar in the field and a member of the faculty. Upon hearing her reply, the other prospective student said he thought the professor might have been someone's husband at the event. Reflecting on the moment, Amaani shared,

> Hearing that made me think, "Well, why did you think that?"— I felt as if he had made a judgment, an unconscious judgment, based on the fact that [the professor] was a Black man in a space that is dominated usually by White men... Even though that wasn't something directed at me, it made me feel kind of aware of my place.

Amaani wondered if a highly regarded Black scholar could be mistaken for a guest accompanying his academic spouse then how would she be viewed in this new academic environment? Ultimately, she decided to attend the institution despite such questions, but she still was hyper-aware of her identity as a Black woman whenever she entered her department:

> I'm constantly aware of my differences, you know, the differences between me and the other people in my department. I'm constantly aware of the number of Black people, the number of minorities, and then number of women that are in a space. Whether it's in a lab group meeting or wherever I'm always aware of these things and so I think by default—I feel like if you're in a space where you feel welcome, you're not thinking about those things too much, you know? If you truly feel welcome, you feel like you're amongst people that you're comfortable with and you feel comfortable like you're in a familiar space. Or even if it's not familiar, you feel like you're fully being brought into

> the space and your voice is as important as anyone else's voice. Those are things that I don't feel.

Amaani recognized that if she actually felt welcome in her department, there would be no need to count the other People of Color and women in any given room. However, more than that, she believed that being welcome implied an invitation into the space, which she never received.

Similarly, Cadence spoke of how she avoided a common area in her engineering department unless she had a clear purpose for occupying the space. She said,

> Only because there's not many Black people there, so it's very—It feels like I'm more like an outsider whenever I go there, unless I'm there with a group of people and we're having a meeting. I have a lot of my outreach meetings. I do a lot of outreach activities. When I'm in one of those meetings, I'm talking to people, it looks like I'm, "Yes, she's doing something there, so she's supposed to be there." That's fine, versus, any other time it's like I just like walk by the space, I can't just sit there like I see other people sit there, essentially.

Cadence's perception of being an outsider in this space was primarily due to her racial identity as one of the few Black doctoral students in her department. Yet, what is striking is how she only felt as if she could be in this space when she had a specific task to accomplish, as if she must have a reason to justify her presence in this common area. Amaani and Cadence's comments bring to mind the CRT tenet of whiteness as property. By virtue of their Blackness, they were subconsciously dispossessed of the right to occupy their engineering environments. Though Amaani and Cadence both expressed that they were never blatantly discouraged from being in their departments or shared academic spaces by White peers and faculty, they understood themselves to be unwelcome.

Imposter Syndrome. Another challenge mentioned by participants was battling imposter syndrome during their doctoral programs. Although all of the participants were admitted into highly competitive engineering departments, many still combatted feelings of insecurity and self-doubt. Some described being concerned that their peers and faculty would find them to be incompetent and unable to succeed in their programs. Others expressed fearing that one misstep would result in them being "outed" as frauds despite their accomplishments and qualifications. Serenity, for example, thought that the grades she was earning on her engineering exams might be a mistake and suddenly her doctoral program experience would come to an end.

> And then when I got my first grad course tests back, I guess whatever grad level test back, I had scored above the whole class…it was just weird. It was kind of like, I don't know, it just felt like maybe a mistake was made…I guess I was just kind of waiting for the fall. It's like I know this ain't right so something has to go. This is going to end soon.

Contributing to Serenity's fears was her experience studying chemical engineering as an undergraduate; after struggling academically, she switched to another engineering major. She returned to chemical engineering to pursue graduate studies and work with the advisor providing her fellowship. In graduate school, Serenity was surprised that she was excelling in her classes as she worked alongside students who came in with chemical engineering bachelor's degrees, which led her to believe that her success in graduate courses must have been a fluke.

Conversely, other participants described fears of being labelled as incompetent when they encountered setbacks with their research. Lailah worried that at any moment her advisors would dismiss her from her doctoral program because she was experiencing challenges with her research. She explained,

> Yeah, I don't know, I just feel like I'm trying to push for this paper, but every time I go like I don't get results...I feel my advisor is probably already frustrated. So, it was just me like they going to say, "Okay, Lailah, this is it. You're not in good standing academically." Having that conversation like because I know it's going to come eventually, because I still haven't published, still working on basic stuff.

During our conversations, Lailah spoke of how easy it was to compare herself to others around her. When she saw other students excelling and progressing with their research, it exacerbated her fears that her time as a doctoral student was quickly running out. Relatedly, Amaani dreaded attending her research team meetings for fear that her lab mates or advisors would question her capabilities. Amaani recounted the experience, saying

> I used to go into lab meeting and I would be praying to God like, "Please let me get through this meeting without being put on the spot or like ...," Because I would come out of meetings feeling like I looked so stupid. Everybody probably thinks that I'm incompetent now and every year probably like, "How did she get in here? How did she get this fellowship? Blah, blah, blah." I would come out of meetings thinking that, so I would go into meeting like, "Please God let this meeting just go. Let me fly under the radar in this meeting." If it did go well I would be like, "Thank you God."

When Amaani was unable to reproduce the results for one of her experiments she felt as if her advisor lost faith in her. She shared, "So that time was really hard because I already felt inadequate. But then also I felt like my advisor felt like I was inadequate."

Though graduate school is place where students can receive advanced training and continue their learning, many participants in the study felt as if they could not afford to struggle or make mistakes. For Lailah and Amaani, the pressure to perform coupled with unexpected

setbacks in their research, heighted insecurities about their capabilities. In Serenity's case, even when she was excelling, she harbored anxieties that her success was not real and perhaps unsustainable.

Mental Health. Multiple Black women in the study described experiencing symptoms of, or being diagnosed with, depression during their academic careers. At various points in their educational journeys, participants expressed finding it difficult to get motivated or leave the house and a few mentioned experiencing suicidal ideation. However, they all reported that they sought out support when they had these feelings, whether that was spending time in the company of friends and loved ones, confiding in spiritual counselors, or getting professional help from therapists. Additionally, Black women in the study spoke of how their spirituality was either a driving force for them to seek help, or a way for them to find hope in the midst of a challenging situation.

When Cadence came to graduate school, she was met with an onslaught of new challenges. She was transitioning to a new environment, taking difficult courses, and adjusting to life as a graduate student. During that time, Cadence skipped meals, did not sleep well, and stopped her exercise regimen so she could keep up with her demanding workload. She, too, reported experiencing imposter syndrome:

> It's a struggle. Just feelings of, do I really—am I really capable, I guess, of doing the program? Is my work really good? Things of that nature. Struggling with thoughts like that. And so that just kind of barreled down on me, and then I guess my spirituality wasn't enough to, at one point, wasn't enough to ward off those feelings. So, it just became, just started spiraling and yeah, it did take me to a dark place. So, I sought out help.

After having a negative counseling experience as an undergraduate, therapy was not Cadence's first choice in managing her mental health. However, she felt this time would be different. Her recognition that she was headed down a "pretty dark path" drove her decision to seek help, but she also felt her spirituality might have been an impetus.

> I had, I guess, this feeling that it might work this time around. Must have been the spirituality coming back into play, but thinking, "Hey, maybe you should do this thing, 'cause it will work this time." And it did.

Once she began therapy, Cadence became more intentional about taking breaks from work, doing things that made her happy—like going to the movies—and making time to exercise.

Harmony did not seek out professional help when she struggled with mental health concerns, and instead relied on her faith to help her through that difficult time in her life. While studying engineering as an undergraduate, Harmony remembered feeling her lowest. She was unstable financially, navigating a challenging roommate relationship, and struggling academically. However, her spirituality gave her a sense of purpose and the will to live.

> I don't think I would've been clinically prescribed as depressed or having anxiety, but there were lots of days where I didn't want to eat or get out of bed. So, I'm just like… I was really sad, if anything. Yeah, and literally having lots of times where, like suicidal ideation where I'm like, "I just really don't want to be on this earth. There's literally no point" and it always coming back to, "Well, you have a purpose" and literally that only coming from the fact that I was in Christ and knowing that you have a purpose on this earth and you can't just waste your life. That was the only thing that kind of got me through the day, like those types of times.

When asked what about having a purpose helped shift her mindset, Harmony responded,

> I think the main shift was just understanding, you don't have a right to feel like you don't want to live because that's insulting to God. He created this whole place, and placed you in it. For you to be like, "I want to die" is literally an insult. And so, whenever you realize you don't have a right to something, then you're like, "Okay, well, how can I switch my mindset to where I don't think this as much." Because I can't just be like, "Oh, well, I'll do what you want me to do. But I'm not going to be happy about it." That's not how God wants us to live life.

Harmony viewed her life as a gift from God that she should cherish. Therefore, she determined that she would not only live, but also live joyfully as an expression of her gratitude for the gift of life she had been given.

Though markedly different in their responses to mental health concerns, Cadence and Harmony both discovered what they needed to overcome the challenges they faced. For Cadence, her spirituality gave her a glimmer of hope to retry therapy, while Harmony's faith changed her perspective on her life's worth. Other participants in the study relayed similar stories of how their faith motivated them to seek out support of various kinds (e.g., confiding in loved ones, getting professional help) and reminded them of their purpose when they were experiencing mental health concerns in during their educational pursuits.

Discrimination. Perhaps one of the most common challenges Black women in the study discussed was experiencing discrimination. Participants rarely described overt discrimination against them on the basis of their race and gender; instead, they perceived subtle forms of gendered racism in their interactions with peers and faculty members. Additionally, these perceptions of discrimination were not limited to how others treated them in their labs and departments; they also observed differences in whose needs were prioritized over their own.

A few participants recalled experiencing overt discrimination from their peers. For instance, when Celeste tried to form a study group with some White males in her class, she was struck by their rudeness and clear disinterest in working with her as one of the only Black women in the course. After asking to exchange phone numbers, one of her peers said he did not own a phone although she saw it in his hand. Another said he could not remember his phone number. Hearing their laughter as she walked away, Celeste said she realized she was on her own. She recounted the experience, saying,

> I've tried to cling on to a group that I thought was the head of the class, and I'm pretty sure they did not want me in their group 'cause I was Black, and I was a female. They were Caucasian men. They were very nasty and rude to me, but I made it a point to continue to thrive. I ended up getting the highest grade in the class, and they could not figure out how or why. That was definitely faith, 'cause God, He helped me show out— 'Cause they look at you like you're the help almost. They look at you like you can't be on their level. That's not the case. I'm pretty sure I proved that.

Using her peers' blatant disregard as motivation, Celeste strived to excel in the course. Although she initially felt defeated after her first encounter with her White male classmates, she felt it strengthened her, "[That experience] was definitely tough. It just made me stronger."

In contrast to more overt acts of discrimination, participants most frequently described more subtle discriminatory behaviors from their peers and faculty members. Typically, these slights and acts of disregard were so subtle that participants were uncertain if what they were experiencing was real or imagined. For example, Harmony indicated that when she made suggestions in her engineering teams, the group would ignore her comments but respond to the

same ideas if another person shared them. She was unsure whether to attribute those moments to her race or gender.

> So, if it's anything, it's microaggressions where it's hard to tell, pinpoint specifically what it is. But, I face that a lot. I face people [not] listening to me a lot. And I face people not connecting with me a lot, but I just don't know if that has something to do with my race and gender.

Other participants echoed Harmony's experience, sharing that they found it difficult to claim that the differential treatment they received from peers and faculty was as a result of their race and gender. Have completed her undergraduate degree at a historically Black college with a supportive, predominantly Black community, Nadia was unaccustomed to more subtle forms of discrimination she experienced in graduate school. She explained that for years she buried the backhanded compliments, insults, and invalidations she received from her advisor and peers because she had never experienced anything like it before.

Nadia recalled arriving at her graduate institution and having what she believed to be a casual conversation with her advisor. Over dinner, Nadia's advisor asked what her parents did for a living, and upon learning that they each held blue collar jobs Nadia remembered watching the smile vanish from her advisor's face. Reflecting on that moment, Nadia said, "[I] wasn't used to that kind of treatment at all so I don't understand how to explain how it made me feel. But I didn't realize there was something wrong with that." Nadia later learned that her fellow lab mates' parents were highly educated, several having earned doctorates, and there were a few who were recipients of prestigious awards in the sciences. During our conversations, Nadia shared several moments where she felt undermined and disrespected by both her advisor and her peers in the lab. Once, when Nadia was being commended for her research by another faculty member,

without hesitation her advisor remarked, “Yes, Nadia is very talented; in my lab most of the people have a failure rate with experiments of 90 or 95 percent, Nadia’s failure rate is 99.” Moreover, although Nadia was one of the more senior students on the research team, she recalled being ignored or disregarded by junior lab members when she offered advice. When she shared her perceptions that she was treated differently with one of her colleagues, the other student replied that she never noticed. When asked why she believed her advisor and peers treated her the way they did, Nadia surmised,

> It’s probably I’m not seen as equal. I don’t know. Maybe that’s what I’m saying. I know that I didn’t see myself as equal because I’ve been at that level for so long, that I need to not even see myself as an equal, but just see myself as the best that I can be, and love the people who perceive whatever it is and that’s what I’m building to be. That’s where I’m trying to be now.

Over time, the slights and digs that Nadia attempted to overlook in her academic environment left her with the impression that she was unequal to her peers. Although she was never explicitly told that she was unequal based on her race and gender, Nadia could think of no other explanation:

> This graduate program taught me that you can’t live in this environment without being assertive and showing people… that you know what you’re doing and you know your stuff. Because the baseline is that people like me, I can’t prove that it’s racism. I don’t think that’s my job right now to prove that it’s racism. But I do know that People of Color, Women of Color, Men of Color, definitely are not given the benefit of the doubt.

Nadia’s experience harkens back to the CRT’s persistence of racism tenet. Though Nadia could not say for certain that her advisor or lab mates were racist, their treatment of her signaled an

underlying perception that she was less than. Moreover, in stating that Women of Color and Men of Color are not given the benefit of the doubt, Nadia also implicates the role of gender in her mistreatment by her peers. Nadia's statement implies that as a Black woman, she is not presumed qualified, therefore she has to work that much harder to prove that she is.

While participants rarely reported experiencing overt racism and sexism from their peers and faculty, they did observe that in comparison to their White, Asian, and Indian peers their treatment was markedly different. For instance, when Kala was preparing to switch research teams, she was deeply hurt by her advisor's response. During her tenure in that lab, Kala felt stifled in terms of having her ideas for new research projects dismissed and being relegated to an inherited project that had yet to yield any promising results. Kala recounted that when she arrived as a first-year doctoral student on this team, she received little support or training, which left her to figure out numerous processes and procedures on her own. Kala described becoming progressively withdrawn in her lab because she felt that the contributions she made and the accomplishments she achieved were often ignored. Yet, when her transition was imminent, she received a lengthy email from her advisor, with higher level administrators copied, outlining her lack of progress and disappointing performance to date. Kala was shocked to receive this message because until that point she had never been given such feedback, despite regular reviews and meetings with her advisor. Reflecting on that experience, Kala felt that her former advisor never truly saw her potential as he did with the other students. She recalled,

> I look back on it and I wouldn't say that like, I wouldn't say he was racist. I don't know if he was racist, but I knew that he didn't see success in me, as he saw on the other students. Because to him a successful student was either from what he had a White male, or White female, or Indian male. That's what he saw success in. For those students they were being

> successful, they were producing stuff but me, I wasn't. Then for me to like— in the midst of all this thinking I did everything right that I checked all the boxes, crossed all the t's, dotted all the i's and still at the end of the day, that's what it came to.

Kala's comments denote that while she could not name her advisor's behavior toward her as racist, she understood that there was a difference in his perception of her versus her White and Indian peers. According to Kala, in comparison to her peers, her advisor's inability to see the potential for success in her manifested as a lack of investment in her development and recognition of her contributions. As Kala noted, in the two years she worked in the lab, there were numerous opportunities for her advisor to communicate any concerns he may have had about her performance, as well as to outline a mentoring plan for improvement. It was only when Kala decided to seek another research opportunity, that her advisor relayed his criticisms to not only Amaani, but also other department administrators via email.

Aliyah also perceived differences in the ways in which students were supported in their academic pursuits. In a journal entry, Aliyah wrote, "I feel like only White and Asian men are set up to thrive in this department." Elaborating on her reflection in an interview, Aliyah shared two stories to illustrate her point. She remembered an incident when four Master's students failed a course. While other students' advisors advocated for their advisees' grades to be changed, another Black student received no support and was at risk of not earning enough credits to graduate. With Aliyah's help and the backing of another administrator, the Black student was also eventually granted a passing grade; however, the lengths to which this student had to go to achieve the same outcome as his peers was not lost on Aliyah. The second story Aliyah relayed concerned a White male student who was suspected of cheating. The student was dropped from the required class and would potentially be unable to graduate for a lack of credits. The

department, however, ultimately decided to waive the required course for the White student who then fulfilled the missing credits with research hours in order to earn his master's degree. Though both students were at similar risk of not earning enough credits to graduate from the master's program, the White student received vastly different institutional support. After sharing both stories, Aliyah concluded, "Because even if you don't know shit, as a White or Asian man, you will still get spoon fed the way they spoon fed [the White student] through the department."

Kala and Aliyah perceived that White, Indian, and Asian students received more departmental support than Black students. Though Kala and Aliyah did not label this differential treatment as overt discrimination, they recognized it as being problematic. Kala and Aliyah's reflections highlight yet another manifestation of whiteness as property. From their perspectives, "whiteness" granted their peers with capital that could be utilized in their academic environments; for example, the White male student receiving departmental support to earn graduate credits after being suspected of cheating in a course. However, it is important to note that Kala and Aliyah also include Indian and Asian men in their discussion of how whiteness gets privileged in their departments. Kala and Aliyah perceived that Indian and Asian men were also conferred the property value of whiteness, which afforded them the credibility and access to institutional resources and support that Black students did not always have, at least not without struggle.

Assets in the Tunnel

Although Black women in the study experienced great challenges in their doctoral programs, they utilized the assets they possessed to overcome them. Participants engaged in in resistance by exercising agency and drawing upon their spirituality for empowerment. Additionally, participants relied upon communal support systems to remain resilient in their

educational pursuits. Participants also transcended obstacles they encountered by reminding themselves of their ancestors' strength and perseverance in trying circumstances. Taken together, these assets helped Black women in the study maintain a sense of hope and motivation to persist in their engineering academic environments.

Exercising Agency. Participants across the study exercised agency in various ways during their doctoral programs. Some made intentional decisions to switch their research labs and advisors. Others helped organize initiatives to create more welcoming and inclusive environments for students. Further, participants engaged in activities that promoted their well-being such as participating in community service, or decorating their work spaces. All of these acts were strategies Black women in the study used to navigate their doctoral experiences.

Lailah exercised agency by engaging in service. Against her advisor's advice, Lailah participated in a variety of community outreach initiatives during her doctoral experience. Lailah's advisor, a fellow Person of Color, recommended that Lailah concentrate on her studies and wait until she was further established before spending time doing community service.

> [My advisor] says, at this time of your career, you cannot [have] much influence. But once you get your position, then you can help. But no, we don't agree with her, clearly…I want more, my contribution should be today.

Although Lailah understood why her advisor wanted her to devote most of her time to academics, Lailah felt that doing so would be contrary to her faith. Waiting until she graduated, or established her career, before helping others was not aligned with her spiritual values. She said, "I think it comes from spirituality. You have to love others, take care of others." Participating in outreach initiatives was a way for Lailah to stay connected with communities outside of her academic environment and make a difference in others' lives, which in turn kept

her uplifted during her doctoral program. Other students, particularly Cadence, also demonstrated this kind of agency, but did not connect it to their faith.

For certain participants, their spirituality empowered them to resist being bullied or demeaned in their advising relationships. Nadia, for instance, found strength in believing that she could be a Black Israelite descendant. In reading more about alternative interpretations of the Bible that depict early Israelites as People of Color, Nadia could envision herself as one of God's chosen people.

> African American history kind of stops at the slave ship, it's like what happened before that? So, I'm like well maybe this is an answer here. And I started seeing myself as a child of God, you know really… But yeah, so that's when I started believing just that I have heritage that's royal, or from God.

Believing that she could be divinely descended from God, completely changed Nadia's outlook on her relationship with her advisor around her third year in her doctoral program.

> My spirituality at that point really made me feel that [my advisor] is not my boss, like she's not my God, like she's not this person [leading] to my doom. Like someone I have to listen to. I'm a child of God and from that I'm not scared of [my advisor], you know, when I'm in that state.

Nadia's identity as a child of God emboldened her to stand up for herself and let her advisor know she would no longer tolerate being mistreated. After withstanding the slights and acts of disregard from her advisor for so long, Nadia decided to tell her advisor how those invalidations made her feel.

> I've told her how I felt about her interactions with me in public and that they were demeaning and I have—I continued to do that to the point where she now respects me

and may be acting, but that's fine because I notice if I do speak up a little bit, she'll go back to the way she was so I'm just like, "Okay, let me just know my boundary."

Though unconvinced that her advisor's more respectful demeanor was entirely genuine, Nadia felt more confident in confronting her advisor about her behavior when she deemed it necessary. In the past, Nadia was reluctant to address her advisor, recalling "Part of me not speaking up was because I felt like I couldn't." However, as Nadia prepared to graduate and move forward in her career, she decided that expressing herself and not allowing people to mistreat her was an important step in becoming who she wanted to be. She shared graduate school taught her, "[to] just not be afraid so much to speak up and tell my truth…I thought I was protecting myself by being quiet, but I realized that I did more damage to me, and people around me."

Aliyah's spirituality also changed her perspective about her relationship with her advisor. She began to view her interactions with her advisor as a spiritual battle. Referring to the challenges she encountered in her doctoral program, such as fighting to conduct research in her topic area of interest and negotiating power dynamics with her advisor, Aliyah remarked, "I do think it was a spiritual battle, 'cause all this stuff I've been through here, it's all just been something." When Aliyah's advisor would insist that she publicly acknowledge any assistance he provided her, she felt that he wanted the glory for her accomplishments. For example, when Aliyah was working on a co-authored manuscript and sent the document to her other collaborators for review, her advisor messaged the entire group stating that he had provided substantive revisions without proper acknowledgement in her email, despite being named explicitly as a contributing author.

It's always about me giving him credit. Or everybody, if you're my advisor, everybody knows you…that's something I shouldn't always have to email, "Oh, he revised this,"

just stuff like that, him getting credit. And then when he makes a mistake, it's, "Oh, it's a learning experience for the both of us." Really? And [my advisor is] the professional.

Or, when Aliyah would achieve promising results in her experiments using alternative methods, her advisor would diminish her success, saying her methods were not "good science."

He would always do this other manipulative thing, like, "Oh that's not good science. Good science is this," to try to get me to do something another way. He'll say, "Oh, I would have did it like that." I'm like, "Well, that's not how I did it…" I feel like oftentimes whenever he said it, it would be like this, him telling me to do something, and when I'm questioning why or, "I'm showing this, so why do I need to show that?", it's always, "Well, that's good science." So, kind of this hierarchal structure of, "I know because I'm this and I'm that. You wouldn't know, 'cause you're new in the field.' So, either him wanting to kind of try to manipulate me to do something, something of that sort.

However, Aliyah viewed her advisor's actions as spiritual tactics that were dishonoring to God.

I felt like the enemy, Satan, the devil, however you want to characterize it, was working through him…and my therapist also helped me see that when I would say some stuff. She was like, "No. He's trying to control you in a way that is not honoring God, each time."

That perspective encouraged Aliyah to confront her advisor on a spiritual level, choosing to read scriptures, listen to sermons, and pray for wisdom when interacting with her advisor, rather than arguing with him or simply acquiescing to his demands.

So, there was this T. D. Jakes sermon that I played a lot and it was, I think, *In the Presence of Beasts*, or something, or *Fighting in the Presence of Beasts*, something like that. And then, also a lot on spiritual warfare, so Ephesians, putting on the whole armor

> of God, those. But at least with my advisor, I felt like a lot of his stuff was more spiritually, more of the spirit realm of ways [my advisor] was trying to control, and manipulate, and deal with me.

Aliyah's spirituality helped her reframe her relationship with her advisor as a spiritual contest, which equipped her with strategies to resist being manipulated and treated as subservient by her advisor. By fortifying herself with scriptures, prayer, and spiritual teachings, Aliyah was able to remain focused on her goals and not get distracted by her advisor's behavior towards her.

Community and familial faith-based support. Black women in the study also relied heavily upon community and familial support to overcome challenges in their doctoral programs. In difficult times, participants reminded themselves of their families' sacrifices to help them reach their goals, or reached out to their loved ones to receive spiritual encouragement and prayer. For example, Taryn would think of her parents' decision to immigrate to the United States to ensure their children would have more academic and professional opportunities. Taryn shared,

> looking how much my parents have sacrificed for me—and maybe every immigrant child has this mentality—but looking at the fact were living a pretty okay life back in Kenya, and then to come here and work double jobs each— like my Mom does not sleep. And so, to make that sacrifice for— so my brothers and I could have this opportunity is just amazing. And so, I feel like so indebted to them. And it's just amazing that they loved us so much just to do this.

Taryn felt that it was her responsibility to achieve academically and make her family proud, because she did not want her parents' sacrifices to be in vain. Moreover, when she felt

overwhelmed with her academic work, she would call her mother and receive the encouragement she needed to carry on.

> And so, I'll be struggling and [my mother will] be like, "[God's] not going to bring you through something that you can't handle. And there's always the, "you know He brought you [to graduate school]. He's gotta finish that work." And I'm like, "You know what, mom? You're right."

For Taryn, remaining connected to her family and remembering their love for her kept her grounded and motivated to keep striving in the midst of hardships.

When Kala faced challenges in her doctoral program experience, she reached out to friends and family members for prayer, believing that when she felt depleted, their spiritual strength could help sustain her.

> What I have come to realize is that I lean on my friends a lot more during those difficult times. It's certain friends in my friend groups in particular that I'll lean on because I feel as if, going back to spirituality, their spirituality and strength in that is stronger than mine. So, by going to church stuff, how people always say like, "Oh, why do Catholics pray to saints?" It's not that Catholics are praying to Saint Agatha, but rather we're asking Saint Agatha to pray for us to God. Because obviously, they went through some stuff and God answered their prayers. So, it's like asking your mom to pray for you, somebody that you think is stronger than you and something that has a closer ear to God maybe so that it touches because you don't feel as if it's touching from yours alone. But still like seeking out your own [and] asking, but asking somebody else to also intercede on your behalf. So those particular friends that I have that are like—one of them, she's not even really religious, but I just feel as if her spirituality so grounded and so [sound] and strong.

Kala trusted that when she reached a low point in her doctoral journey, she could rely on her loved ones' faith to help jumpstart her own. Having friends and relatives interceding for her in prayer, encouraged Kala and gave her the sense that her needs were reaching God. As was true for Taryn and Kala, the support of family members and friends was incredibly important for several participants in the study. Even when their loved ones did not always fully understand the difficulties participants encountered in their doctoral journeys, they often offered the reassurance and love these Black women needed to continue pressing forward.

Moments of validation. For Black women in the study, key moments of validation were also highly motivating during difficult times in their doctoral programs. Receiving awards or reaching important milestones often gave participants the confidence and affirmation they needed to feel as if continuing their educational pursuits was the right path. For instance, in Amaani's department an award was granted to advanced graduate students who demonstrated exceptional service and academic achievement in their scholarly community. Amaani recalled debating whether or not she should nominate herself for this award as she battled with persistent feelings of imposter syndrome.

> In my time here, I've done so much for my department. And I'm making good progress in my research now, and my grades have been fine. But, for some reason, I just felt like this award doesn't go to people like me. It always goes to some guy that has the highest GPA whether or not they've done anything for the department or not.

Though still uncertain whether she would seriously be considered as a viable candidate for the award, but incentivized by the cash prize granted to award recipients, Amaani prepared her application materials. However, the evening the application was due, Amaani struggled with the decision to actually submit it.

> I worked on this nomination, and literally I went from like "What am I doing? I'm not going to nominate myself. I'm not qualified for this. I don't have the highest GPA." Literally, I was so close to just being like, "No. I'm just not going to submit it," like the night before it was due…And I was like, "You know what? I'm going to nominate myself. I'm going to put it in God's hands. God knows what I need. And if I don't win this award, He'll provide for me one way or another. But I'll just submit the nomination. I'm going to do it."

Leaving the outcome in God's hands, Amaani sent her materials for consideration and waited for the news.

> So, I submitted the nomination, and then I won the award. And I literally was crying when I found out… I was so close to not submitting it. And when I saw that I won the award, I was like, "I can't believe that I almost sabotaged myself," because I just thought I wasn't good enough. I don't know. And I just thank God so much that I didn't.

Receiving that award was incredibly affirming for Amaani because until that point she was constantly comparing herself to other people in her department.

> So, because also I had gone through that period of time where my research was basically—everything I had done was kind of like for nothing, I was really comparing myself to other people. So, I had to really rely on my faith to keep me sane.

Submitting her application for the departmental award was an act of faith and when she received it, she felt it was a sign that she was on the right path and God was supporting her. "Considering where I came from before [receiving the award], man, grad school has been such a rollercoaster, and I can see just such a defining point where I started relying on God where things started getting better."

Similarly, when Kala received a highly competitive, nationally recognized fellowship during her doctoral experience, she believed it was a sign from God that pursuing her doctorate at her current institution was the right decision. When Kala received the award, she was still working in her first advisor's lab and feeling unsupported in her professional and scholarly development. The day Kala was publicly recognized as an award recipient, she could not believe she had actually won. After receiving numerous congratulatory calls and messages, she was shocked to see her name listed as an awardee.

> I woke up and I had missed calls, I was like why are people calling me? Then I listen to the voicemail and somebody talking about "Congratulations, girl! I'm so proud of you." I was like, "What the hell is she talking about?" I check my email, and I'm like, "What? This is not real." Then I call my dad, and I check my email again. I was like I could just Google it, and find the list. I saw my name on it, and when I say like—not that I couldn't function right, I was functioning—but it was like I just immediately just started singing my praises, like literally singing all these songs. I was in the shower crying and singing, just singing the whole damn day…

Being awarded such a prestigious fellowship meant so much to Kala because until that point she questioned if she truly belonged in a graduate program. Yet, receiving the award was just the confirmation she needed.

> I was like, this is nothing but God, because I didn't believe that I can win that. It was like for me, I saw that [as] the sign of like validation because I was so depressed my first year here. I was just like, I do not like this place. Why did I come to grad school? Why am I doing any of this? It was like a validation of your ideas are important, your ideas matter,

> and you earned this a hundred 100% by yourself. I had no input from anybody other than like I sent it for my dad to check for errors, but this was me, I did it.

Earning national recognition for her ideas and scholarly potential gave Kala the validation she had been looking for on her former research team, which Kala believed was a gift from God.

For other participants, reaching important milestones in their programs was just as validating as receiving an award. When one participant was preparing to take her qualifying exams, she resolved that she would leave her doctoral program if she did not pass on her first attempt. "I said, 'God, I'm going to do my part, study, what I need to do. And let Your will be done, because I will leave if I do not pass on this first time.'" After previous negative experiences with advisors – one who berated her for reducing her research hours so she could take additional classes, and the next advisor who silenced her ideas in the lab and failed to acknowledge her contributions with authorship on research team manuscripts – the participant decided that if she did not pass her exam, it was time to leave her program. She shared, "between those two [advisors], I'd never felt like I was enough." However, when she passed, she received the affirmation she needed to persist in her program.

> So, when I passed my qualifying exam, ours was a written exam, I passed it on the first try. There were two people that failed. It was unfortunate for them, but that was probably the first time I felt like, "Okay, you're supposed to be here." Because if I had failed, there is no doubt in my mind that I would be gone.

The participant recalled that passing her exam helped her realize that she was more than capable of succeeding in her program after having such difficult advising experiences.

Transcendence. Finally, participants drew upon their ancestry and spirituality to help them transcend obstacles encountered in their doctoral programs. Reflecting on the oppression

and discrimination their ancestors had to overcome gave participants like Michaela and Taryn the motivation they needed to continue persisting in their educational pursuits. Having immigrated with her parents to the United States in the hope for more educational opportunities, Taryn often thought about what it took for her to be where she was—earning her doctorate in engineering at a highly regarded research institution.

> So, for me, as a little girl growing up in Kenya and just all the different experiences that I went through and also thinking about the fact that for whatever reason I got the opportunity to leave Kenya and come to United States. To pursue better education and just through all the different paths that those have taken. It's like "Why me, what did I do to deserve that?" I did absolutely nothing, right? And so, it's just like sometimes you just pause and you're like, you just think back and you're like we've definitely come a long, long way…and not just even me. Think generations back and all the things your ancestors had to suffer just for you to be here. Why were they the ones that survived when other people did not?

Taryn's ruminations often led her to consider the plight of members of the African diaspora and how despite oppressive tools like slavery or colonialism, Black people continued to survive.

> But yeah, it's just like, I think back. Specifically, even with slavery it's like that's a crazy period for anyone to go through. Just the torture and the beating down of a mind which is still very prevalent in generation to generation. Even with colonialism it's a different tool but with the same results. Which is you know undermining yourself as a Black person because of your skin. But we're still making it, we're still alive. We're still pushing.

Taryn believed that it was the prayers of those ancestors that enabled her to continue striving in pursuit of her own goals. Speaking of her particular tribe in Kenya, Taryn shared that there is a

longstanding tradition of respecting ancestors and relying on them to provide support in times of need.

> We have this respect for ancestors. Even if you think back to traditional African religion. You're praying to your ancestors to help guide you through things. So, we believe that there is power in someone advocating for you…And grandparents are known for constantly advocating for their children just constantly praying on behalf of their children and there's power in those prayers. And so, for me growing up and knowing that there's someone constantly advocating for me before God—and that's what Jesus does right, Jesus is always there constantly advocating for us but to also have that on the earth... just knowing that... and I feel like that's the only reason I've gotten through... that I'm here.

Buoyed by the prayers and faith of her ancestors, Taryn believed that she could overcome obstacles as they arose. Relatedly, Michaela also felt deeply connected to her ancestors spiritually, believing that their faith was how they survived slavery and its enduring legacy in the United States.

> I think for me spirituality was one of those things that Black people, or especially descendants of slaves, kind of clung to as a survival mechanism for people who had no skills when they were free, no right to vote, no property, not even ownership necessarily of their own bodies and their children or their marriages. It's one of those things that was really a source of capital for them…

Michaela believed that her ancestors' spiritual capital was passed down through the generations, empowering descendants like herself. From Michaela's perspective, spirituality was weaved throughout the history of African Americans and maintained its relevance in modern times.

Michaela remarked, “I think that the reason [Black people] talk so much about spirituality is because that was the thing that got us through very, very dark times.”

For several participants, their faith helped sustain them throughout their doctoral journeys. Believing that a higher power, or God was there ushering them through their educational experiences gave participants hope and the peace of knowing that whatever challenges they were facing, they were not alone. When asked how her doctoral program may have been different if she did not have a sense of faith, Amaani replied,

> When I think about everything that’s happened throughout my grad school journey so far, my lowest lows, I was depressed, I was suicidal even. I can’t say whether that would have been different. That was during the time when I didn’t really have God, or wasn’t really thinking about God. I can’t say whether I wouldn’t have been depressed or suicidal if I did have God. I don’t know, the thing that I needed at that time was feeling like God was there. Even though it seemed like this is the worst thing, nothing could get better in my life, that God sees my future, and He has a future for me. That would have been, even just that would have made such a huge difference I think.

Although Amaani could not say for certain that having a strong sense of faith would have prevented the hardships she experienced in her doctoral program, she suggested that just believing God was with her would have made those times feel drastically different. Yet, it was those experiences that helped Amaani realize that she needed God’s presence in her life. She explained that she did not want to continue moving forward in her program without God:

> Considering how rough it was at some points, and how alone I felt, I just never want to feel that way again. [Graduate school]’s definitely been a lesson in, I don’t know, a

> lesson in knowing that it's always better to have God. Whether I realize it or not, I do need Him, and things are better when He's around.

Amaani's relationship with God improved her outlook on challenges and gave her a sense of reassurance that no matter what was ahead, God was with her. Taryn also believed that her relationship with God helped her have an optimistic outlook when she faced difficulties.

> I honestly don't know who I would be if not for God to be honest with you. I feel like He's been there for me ever since I was little. Not once has he abandoned me regardless of however many ways I've strayed. And I have strayed, I have. And so, I feel like that's the thing that, it defines me in more ways than I know. I feel like because of my spiritual side if I do ever, if I'm ever going through a rough time I have that encouragement and I can look at it in a positive perspective that some people might not get.

Taryn's belief that God would never abandon her encouraged her in trying times. Having a higher power by her side gave Taryn the faith that she would eventually make it through difficult periods in her life and doctoral program.

Summary

As this chapter illustrates, Black women in the study experienced a number of challenges as they navigated their engineering doctoral programs. Yet, utilizing the spiritual assets they possessed, participants were able to continue forging a path for themselves in their academic environments. Contending with feelings of not belonging, imposter syndrome, mental health concerns, and discrimination were challenges that awaited several participants in the "tunnels" of their graduate programs. However, engaging in acts of resistance, relying on communal support to remain resilient, and drawing upon their ancestry and spirituality to transcend obstacles encountered in their programs gave participants hope of reaching the light at the end of the

tunnel. The poem that follows, conveys the uncertainty Black women in the study experienced as they struggled to find their way out of their doctoral program tunnels. Yet, it also demonstrates participants determination to persist and glimmers of hope as they made their way toward the light.

At times overwhelmed by the darkness
I search desperately for the light
Waiting
Wishing
I try to remember the sun
Knowing that even in this tunnel
It still will rise and set
Rise and set
Rise and set again
Letting me know that this too shall pass
Nothing lasts forever
Right?

Right.
Of course
I chose this, didn't I?
Wanted this, didn't I?
I did, didn't I?
It's easy to forget sometimes when it gets hard to breathe
Hard to move
Hard to see the way out
So, I have to trust
Trust in my knowing
That I can do this
I will survive this
Conquer this
Right?

Right.
And though I am just one
One of only
One of few
I am still One of many
One of us
One of generations
One of lineage
One of destiny

One of promise
One of dreams
And visions
And new beginnings
I am one
One of God
One with God
One
There is power in this one
Right?

Yes.
I make my ancestors proud
Willed into existence
By those who hope and pray
Faithful
They believed me in to being
Spoke me into future
How beautiful to know I was imagined
The possibilities of my potential endless
I have purpose
Divine
Sacred
Holy
That's right.

So, I work hard for it
Remembering those who bled for it
Died for it
I can't stop now
I have to fight
Press
Push
Rest
Gather strength
And persist
Right?

Right.

CHAPTER 6

Spiritual Epistemologies and Ontologies

Portrait of Serenity

Recounting the story of her qualifying exam experience, Serenity distinctly recalled the trepidation she felt when preparing her materials. Having vastly different answers from her peers and self-conscious about her ability to effectively convey her results to the exam committee, Serenity worried that she would fail. She remembered thinking, "Dang, they're getting different answers. Maybe I'm not explaining what I'm saying right. That means I'm not explaining the right paper…Okay, I don't think this is going to work out." The stress of qualifying exams took a toll on Serenity, especially when she realized her answers were not matching anyone else's, but she had faith that if she did her part, God would be there to help her.

> You just be here, you do the best that you can, you look for help, you look for guidance from God, you follow His lead and then things work out the way they're supposed to work out according to what He wants. There's nothing you can do. You don't have control and just that moment was like, "Okay Serenity. You do you and don't worry about it."

As she had countless times before, Serenity trusted that God had a plan for her life and if she continued pressing forward, God would lead her exactly where she needed to be. Serenity's faith

in God motivated her to stay the course, even when she doubted herself. Moreover, she believed that if she gave her best effort, God could intervene on her behalf and help her reach her goals. Trusting God, Serenity decided to present what she had and hope for the best despite still being uncertain about her solutions. When the exam results were posted, Serenity was in utter disbelief, "I was the only person out of the whole group that passed. Everybody else got a conditional pass or they failed. I was just like, 'This makes no sense. It just makes no sense.'" Passing her qualifying exam bolstered Serenity's confidence and assured her that she was capable of succeeding in her doctoral program, "After that I was like, "Okay, I can do this."

Serenity's faith that God was directing her path and orchestrating her future stemmed from her life experiences, which fortified Serenity and allowed her to trust that God was in control.

> The role that [Jesus] plays is he's the leader. He guides everything, whether I realize He's doing it or not—I kind of have struggles with realizing that He's the only person in control. When I'm not in the midst of things and going through things and thinking about things logically, He is ultimately controlling everything. He's definitely the leader of my life; He maneuvers things; He puts things where they're supposed to be and timing. He just controls everything. I'm just the vessel and He's guiding…

Serenity's faith in the guiding presence of God in her life began as a child. When Serenity was approximately ten years old, her father was killed in a drive-by shooting. Suspected to be a crime of retaliation after a pool hall fistfight, Serenity remembered,

> When [my father] passed it was like a movie, it was very, very strange because I was in my bed and it felt late, but I'm a kid, so it was probably only ten o'clock, my grandma made us go to bed at eight. So, it felt like three o'clock in the morning, but it was

probably like ten o'clock, and then my TV was still on, it was on the news channel, then my grandma came woke me up and they told me that he was killed…

Despite becoming more timid and withdrawn after her father's passing, Serenity felt that God filled the void her father left behind: "I definitely feel like [God] filled the space and relatively quickly He kind of stepped in. Because I never really felt like I was lacking in any kind of way by not having a dad…" The same protection and security Serenity felt with her natural father, she began to feel with God. Serenity believed that God strategically placed her out of harm's way throughout her life, which gave her a sense of comfort and safety.

> Just I guess going back to that protection that I felt with [my dad], I just remember feeling it…I think that with God obviously He isn't literally there, you're not sitting in His lap or being held by Him literally, but it's just again going back to the way He kind of— those years and place, you're not in a certain place at a certain time, certain cousins that I would be kind of scared to hang out with—I honestly felt like that was God protecting me, I would always... Things just happen in the neighborhood, or whatever, and I kind of would always be a reason why something didn't happen, or I didn't feel comfortable going…

Serenity's trust that God would lead her where she needed to be, helped her make decisions and explore pathways she never could have imagined for herself.

For instance, growing up in a working-class household, Serenity had limited exposure to STEM careers. Yet, as she began to take a keen interest in math during high school, one of her teachers encouraged her to consider attending college and majoring in engineering.

> My teacher was like, "You should do engineering." I was like, "What the heck is that?" I had no idea what engineering was, never met an engineer, nothing. My mom drove trucks

> and all I really knew was manual labor. I didn't know what I was going to do…I knew I didn't want to be a math teacher, but I felt like that was my only option liking math. Then [my teacher] told me, "No, you can be an engineer."

Though Serenity's undergraduate experience in engineering was incredibly difficult, it positioned her for an opportunity to pursue her doctorate. In Serenity's junior year of undergrad, she attended a National Society of Black Engineer's conference where she was recruited for an engineering doctoral program. Upon graduating with her bachelor's degree, Serenity was faced with the decision of whether she would leave her hometown and take a chance on continuing her education. Once again, she had to trust that God was leading her in the right direction. "It was one of those moments where something was telling me, 'Do this. This is what you're supposed to do.' It's just like I had to rely on God because this is just overwhelming."

Reflecting on where she grew up and the circumstances that led to her pursuing a doctorate in engineering, Serenity felt that she was defying the odds.

> Looking at the numbers, as far as other females, African American females pursuing a Ph.D. in engineering and talking with other females who are in the program and also talking to the undergraduates and getting an idea of where they see themselves and what they think they're capable of, I think my spirituality promotes that anything is possible. You can get through this program, even though like I said, the numbers don't really make sense and technically people like you don't usually pursue these types of careers, spirituality just helps me believe I can finish the program.

Serenity believed that earning her doctorate in engineering would inspire other young people who may have come from similar backgrounds and never imagined that becoming an engineer was a possibility.

> [God] has a purpose for me and I feel like it's being fulfilled through engineering. I really do believe that. I feel like I just sometimes with engineering, I kind of come out of the science more often than a lot of people probably do. I feel like the overall reason for me being an engineer is to be able to just be a representation of what other Black girls and boys can be. To know they can do it, I feel like they have to see other people that look like them. I think that being in engineering and having people reach their potential and all those things all leads to self-confidence and people just doing better for the world. That's what Jesus wants. He wants us to contribute and be good people.

From Serenity's perspective, God had an intentional plan for her life that she was living out on a daily basis. Having faith that God was in the driver's seat allowed Serenity to have a sense of peace, hope, and assurance that she was well cared for and her steps were ordered. Regardless of what statistics or other people may have predicted about Serenity's future, she believed that her heavenly Father was working on her behalf, guiding her exactly where she needed to be.

> I guess, again, going back to knowing who is driving the car and taking the lead, my spirituality allows me to have hope that things will work out the way I was told they would work out, even though the facts don't really say that's where I should be. Spirituality gives me hope.

Spiritual Epistemologies and Ontologies

Serenity's perception and storying of her lived experience was largely shaped by her spiritual epistemology and ontology. While epistemology concerns what is considered to be knowledge and the valuation of that knowledge, ontology refers to how one sees, and operates in the world based on knowledge, experience, and observation. From an epistemological standpoint, it was clear that Serenity believed that God existed and had the power to intervene in

her life. Ontologically, Serenity's decision making in pivotal moments in her life was guided by her understanding that God was real and providing the resources and opportunities she needed to fulfill her purpose. When Serenity intuitively heard, "do this" regarding pursuing her doctorate in engineering, she trusted that it was yet another moment when God was leading her in a particular direction. In this chapter, I discuss how spirituality is implicated in participants' work as engineers, as well as the extent to which Black women experience tension and alignment between their spiritual and scientific epistemologies. Understanding the ways participants' spiritual epistemologies and ontologies relate to their scientific work can illuminate how they see and operate in the world as spiritual engineers.

For all 16 Black women in the study, their participation in this project was the first time they articulated the connections between their spiritual and academic lives. Yet, it quickly became apparent that participants' spiritual epistemologies and ontologies were formative in their understandings of and responses to the world around them. Like Serenity, many participants described their decisions to come to graduate school as divinely inspired by God. Epistemologically, participants who believed that higher powers had the ability to communicate and provide guidance in one's life, often spoke of receiving signs or hearing messages that inclined them to take a certain course of action.

For example, when Devon was applying to graduate school she was only considering master's programs in engineering, until she received a phone call from a recruiter who said application fee waivers would only be granted to doctoral applicants at that institution. Upon opening the doctoral program application, Devon noticed that all of her personal information was already populated in the system. She shared, "My name, my address, and all of that stuff was already in the application and so I guess like looking back, I said to myself, 'This must be a

sign,' like, 'This is where I'm supposed to go.' After receiving her acceptance letter and visiting the campus, Devon decided to attend the only doctoral program she applied to: "I signed up for it, not knowing what I was getting into, and I said, 'Okay, I guess I'll get my Ph.D.'"

Other participants offered similar stories about their decisions to pursue their doctorates, mentioning how they believed God was ushering them toward a particular institution or positioning them to encounter the right people who encouraged them to continue their education. Cadence said that the enthusiasm she perceived from faculty at her current institution during recruitment made her feel that it was the obvious choice: "I think it was God just trying to show me a sign. He's like, 'It's this one. This one.'"

Participants like Devon and Cadence, whose epistemologies included a belief that higher powers could communicate with them, used their spiritual ways of knowing to make decisions, guide behaviors, or derive meaning from the circumstances in their lives. Typically, participants' spiritual epistemologies and ontologies worked together to frame the ways Black women in the study saw and operated in the world, including in their academic and professional contexts. While some participants identified tensions between their personal spiritual epistemologies and ontologies and those of other people in their engineering environments, others experienced tensions between their spirituality and the knowledge and practices they were asked to learn and perform in their engineering doctoral programs. Yet, many also discussed areas of alignment. In the sections that follow, I will elaborate on the tensions participants described between their spiritual and scientific epistemologies and ontologies and points of alignment. I will conclude with a discussion of some of the ways Black women in the study addressed the tensions they experienced and how that influenced their projected post-doctorate pathways.

Spiritual and Scientific Tensions

Participants articulated various tensions between their spiritual and scientific epistemologies and ontologies. Often, these tensions occurred within the cultures of their academic environments. These cultures encompassed the beliefs and practices common in engineering communities, which at times were at odds with participants' spirituality. Some of these tensions were more practical in terms of struggling to balance time between research and spiritual practices, such as attending places of worship. Tensions could also be regarding the ethos of their academic environments, particularly when in conflict with that found in their spiritual communities. Oftentimes, these tensions were ideological, regarding conflicts between positivist understandings of science, and spiritual ways of knowing. Participants also grappled with tensions between their spirituality and their engineering work, for instance when their spiritual beliefs raised concerns about the tasks they performed in their research or industry. Irrespective of the type of tension participants experienced between their scientific and spiritual epistemologies and ontologies, the strain of attempting to bridge their identities as scientists and spiritual people was exhausting.

Practical tensions. In their academically rigorous and intellectually demanding educational environments participants' often felt pressured to devote most of their time to their studies and research, which made finding time for spiritual practice difficult. As a pre-candidate in her program, Taryn was still working to strike a balance between attending to her academic and spiritual needs. She remarked,

> Sometimes it's a struggle that happens every day. It's very difficult to pinpoint. Because one of the things is that it's very easy to get lost when you're doing work. And you just kinda stop going to church because you're like, "Oh I can't go to church because I need

> to do that…" It's kind of easier for you to place a lot of weight – or for me to place a lot of weight on what's going on right now in terms of my research and whatnot and forget the bigger picture, forget that not only do I need to grow academically but also spiritually. Because I'm in an environment where [growing] academically is what's being stressed.

Meanwhile, Lailah, an advanced doctoral student, was experiencing the same challenges that Taryn discussed. Lailah shared,

> I was trying to read more, pray more, but then I feel like I'm not working enough, so as soon as I get [to the office] and started working instead of like praise, stuff like that. Lately, I've just been so busy that I have not really like spent time in the Word and I'll go to church on weekends, but…I just feel like I don't have time for anything. It's just so much that [graduate studies] require from you it's like, "Oh, you have to read a lot, you have to do that a lot."

For Taryn and Lailah, the pressure to be productive and succeed academically often put a strain on their ability to engage in the spiritual practices that kept them grounded. Feeling that there was limited time to do anything besides studying and conducting research may have been a result of the competitive academic environments there were in. Participants' academic cultures created pressure for participants to adhere to the norms and practices in their engineering environments, such as working incessantly. Trying to keep pace with her peers, Lailah said, "I feel every time people are just like, 'You've not have done that yet?' I'm like, 'No.' I don't know if I'm just like slow to do everything, because other people do it." In working to meet the demands of their engineering doctoral programs, Taryn and Lailah found it immensely difficult to make time for their spirituality.

Ethos tensions. Black women in the study also described experiencing tensions between the ethos of their spiritual communities and that of their engineering environments. For instance, Maya's cultural upbringing and ontological orientation encouraged cooperation, kindness, and open communication; however, she felt the opposite in her engineering department.

> I just don't feel a part of the department, maybe culturally, and there's been a lot of passive aggressiveness between students, which is not part of my culture at all. People are very unified and supportive, friendly, at least where I came from…[My current department] feels competitive, and doesn't feel supportive. There is some support, but it feels not as tight-knit as it could be. Definitely a lot of broken links.

Maya's perception of her department culture inhibited her from expressing her true self when her peers and faculty were present.

> A part of me feels like I put up a shield or a guard to look or act a certain way, to deal with all that happening. If I don't trust people, then my own attitude changes, or like how I try to...What's the word? How I represent myself changes as well.

Nadia also mentioned feeling as if she could not be her authentic self in her academic environment. In her research lab, she felt constrained in her ability to demonstrate her leadership skills as she was accustomed to doing elsewhere. She explained,

> Well in the Ph.D., I haven't had a chance to be a leader in the lab, because as soon as I came here I felt like I was shut down. I know that I'm in my place and here is the boss and I need to be quiet. That's how I feel. [My advisor] told me not to talk. I didn't talk. She told me I talked enough during group meeting...Early on, that's what she told me.

As Nadia's graduation approached, she felt that she would have the freedom to be the leader she knew she was.

> I'm going to leave [this program] soon. Some of the other things that are with my spirit that I don't necessarily agree with in academia, I think it's just being a leader. Everything else I think is fine, but just the nature of whatever it is I've experienced in this lab. I don't agree. It's not right with my spirit, just the nature of this lab. But I think once I leave, I can make it more of what I want, but not right now…I can't breathe. Yeah…It's like our first need. In terms of biology, you need blood circulation but you have to be able to breathe before you eat, drink, drink water…And I feel like I can't breathe.

Nadia felt so culturally and spiritually confined in her lab that she likened the experience to not being able to breathe. In Maya's case she associated the culture of her department with the broken links of chain, which could be associated with dysfunction and a lack of cohesion. For these participants, and a few others, the cultures of their academic environments stifled them spiritually, resulting in their inability to bring their full selves into these spaces. Ontologically, Maya's spirituality encouraged her to work cooperatively with others and find ways to support those around her, while Nadia's spirituality empowered her to be a strong leader. However, neither Maya nor Nadia felt comfortable being these versions of themselves in the engineering doctoral programs.

Ideological tensions. Participants also spoke the tensions they experienced ideologically in their engineering doctoral programs. Positivist ideologies that emphasized rationality, logic, and reliance on scientific methods to explain phenomena raised questions for participants who embraced theistic ideologies. Black women in the study at times felt at odds with the man-made metrics and methods scientists used to substantiate claims in research when participants believed that what was "known" scientifically was actually revealed by God and there were limits to humankind's understanding. Speaking of such ideological tensions, Aliyah shared,

> You know how you fit your data to exponential—all these different curves to try to explain? But most of the time, it doesn't fit to anything…There's a lot of it, all these statistical metrics to further validate what you say. But all of these are just kind of metrics that were basically made up to try to also provide some sort of validation. And I just, I don't believe that, I personally don't believe that as, I guess, human race, we'll uncover everything that God has laid out for this world, and why certain things happen. I don't believe we'll get there, 'cause we're not God. But if you have the mentality that we can uncover everything, there is an answer, there is a way to prove it, there is, then of course, you're always going to be kind of in that cycle. And I feel like sometimes my advisor—when I'm like, "Well, it doesn't fit"—and then it's kind of like they're trying to force it to fit some type of way. And I'm like, "Well ethically, isn't that wrong?" But then I realize, "Well, this is part of the game. This is what everyone is doing."

The "mentality" Aliyah refers to in her remarks reflects positivist ideologies. But for Aliyah, believing that there is always an answer that can be found scientifically did not resonate with her spiritually because she believed that God possessed all knowledge and decided if and when it would be revealed to humans. Aliyah also raised concerns about the ethical implications of attempting to "force" data to fit into imperfect statistical models. However, she recognized that these practices were a "part of the game" in her field, meaning that scientists and engineers were commonly using these methods in their research which professionally normalized them. Although Aliyah may not have always agreed with such methods, as an emerging scholar in her field, she was being socialized into normative scientific practices. In this socialization, Aliyah did not forgo her spiritual beliefs, but she wondered if her spirituality inhibited her from wholeheartedly seeking answers to the problems posed in her field, saying:

> I feel like engineering, oftentimes, just tried to fit something to make sense. And so, I believe sometimes that works, when God envisions it to. And the times it doesn't, it just wasn't supposed to. I don't question that as much. And so sometimes I wonder if I can really dig as deep as was perceived in my field, because I have that.

At times, Aliyah wondered if her spirituality— specifically, believing that some things just are not meant to be known, unless God chooses to reveal them—inhibited her from delving deeper into the unsolved questions of her field. Taryn had similar concerns as Aliyah.

Since Taryn was a small child, she recalled having a strong sense of faith. Throughout her life she remained grounded spiritually in Christianity, though at times she questioned if her faith limited her scientific curiosity.

> I was raised in a Christian home. My parents were not so Christian-like. As a little girl I was the one who brought them back to the Bible and everything so that's all I really have known and it scares me to think about what would happen if I were to diverge from that path… But the crazy thing though is that there is also this other part... so this is where the scientific part and the engineering's always just constantly bashing because it's like, "yeah, you've always had that, but maybe you're just weak and you don't want to look... you know peer over the mountain and actually see what there is to see on the other side." You know, it's crazy. But it is there.

The positivist ideologies that pervaded science and engineering led Taryn to wonder if her faith prevented her from fully delving into more scientific explanations for how the world operated. Yet, Taryn recognized that along with her spirituality these scientific ideologies were a part of her as well. Even if it seemed "crazy" for her to think that perhaps her faith was a shield from more logic-based, rational schools of thought, she acknowledged that the question was there.

Taryn and Aliyah's experiences demonstrate how scientific and spiritual ideologies could be at odds for study participants and the ways they began to think through these ideological tensions in their work as engineers.

Professional tensions. Finally, Black women in the study shared how their professional work and research as engineers conflicted with their spiritual epistemologies and ontologies. Lailah, for example, conducted research that involved experimentation with live animal subjects. Though the mice Lailah used were specifically bred for research, occasionally she questioned why she did not feel more compassion toward the creatures whose lives were given to advance scientific knowledge. In a journal entry, Lailah wrote,

> Lately, I felt really bothered by the fact that I don't feel anything when working with these animals. I do not treat them as other beings that deserve to live, et cetera. I completely understand and agree with the need of animal studies for the development of new drugs to help treat diseases, but actually doing the work myself makes me question my morals.

Spiritually, Lailah felt she should be more empathetic toward her animal subjects and she worried about what it meant that she did not.

> I mean if you stopped to think like you can see [the mice] have hands like us…even teeth like us. So, like I relate to them but then like, "oh, but I'm about to kill, you know…sacrifice you," and so like maybe it hasn't been unconscious…so that like bothers me sometimes, but I say it doesn't, but because everybody does because it's part of research. Right?

Although, on some level, Lailah could relate to the animals she worked with, she was able to proceed with her work because she felt that it was contributing to the curing of diseases. Yet, she

was still bothered by the nature of the work she needed to do in the lab. Lailah's questioning of her morals in response to her research highlights the spiritual tension she was working through as she engaged in her engineering work.

Parker also experienced tensions between her spirituality and her work as an engineer. Speaking more generally, Parker felt that when engineers developed technology that privileged a particular type of user it was contrary to her spirituality. "I guess when we're developing products, or applications, or just developing systems…and we're not inclusive to all, then I think that's when we're not being spiritual." Using the example of machine learning algorithms, Parker noted that they were not as effective when used in applications involving Black women,

> Like machine learning for an example, doesn't work well against Black females—it does better on Black males, but it doesn't work well on Black females. And even though it doesn't work that well on us…If it's already been deployed, people use it, but it may not work well against everyone.

From Parker's perspective, if God was accessible to everyone that sought after Him than technology should also strive to be that way, "I think it would be awesome if when systems are created that they are generic to the population in which they service…And so, from a spiritual sense, God is available to any and everyone who wants Him." Parker's spiritual ontology encouraged her to practice inclusivity and work to develop engineering solutions that could be used by anyone, however, she felt that the field of engineering more broadly might not share her perspective.

Spiritual and Scientific Alignment

In spite of the tensions Black women in the study grappled with regarding their spiritual and scientific epistemologies and ontologies, participants also found areas of clear alignment.

Rather than viewing spiritual and scientific epistemologies as separate, some participants in the study found ways to bridge these different ways of knowing, or saw connections between their core values as spiritual people and the values of the engineering profession. Additionally, there were women in the study who viewed the work they did as engineers as divinely inspired. Though these Black women were often responsible for the sensemaking that allowed them to see such connections between their spiritual and scientific epistemologies and ontologies, the work of building those connections helped them view their profession as spiritually purposeful.

Bridging scientific and spiritual epistemologies. From an epistemological standpoint, some participants in the study believed that spirituality and science could co-exist. Further, they believed that scientific explanations for phenomena could also be encompassed within their spiritual ways of knowing. For example, Taryn initially struggled to reconcile the biblical creation story with scientific theories, such as the Big Bang. However, when Taryn stumbled upon an alternative explanation of creation that allowed her to maintain her spiritual and scientific worldviews, she was finally able to bridge these seemingly conflicting epistemologies. Taryn explained,

> So, I think I listened to someone on TV like a while ago, or I don't even know if I was reading about it but they were saying, even if you read back in the Bible there were timelines where you have people who live to [be] like a hundred and something years [old]. But, one other thing to keep in mind is that since the seven days, again it goes with the whole God is this other being that we do not understand. Those seven days to Him could've been like a million years to us. That's not necessarily the timeline that we're working with here. So yeah, that helped clarify everything because it's like honestly if all we humans are dying and God is still God, because there's also another verse in the Bible

> which is just like we're just like a flower that just blooms and then it's just gone…like I mean it's just putting things into perspective that those seven days may not necessarily have been literally seven days. It could have been like thousands upon thousands of years, just depending. So, we don't know. So that's when I was like okay, cool. I'll take it…So that's how I reconciled that whole shebang. And also, some people will say with the Big Bang there must have been a banger.

Adopting an alternative conception of time allowed Taryn to continue believing that God could create the entire world in a matter of "days." She also was able to remain open to the idea of the Big Bang, with the understanding that God likely initiated the universe. Taryn's ability to bridge these scientific and spiritual epistemologies helped her maintain her faith while not foreclosing scientific theory.

Relatedly, Harmony viewed science as a way to better understand God's creation. This perspective allowed Harmony to believe that science could further substantiate her faith.

> It's just bold to me, because I feel you can either make science oppose God or it makes God even cooler. Because a lot of people are like, "Oh, science, I believe in science, not God." And I'm more of the understanding of, "well God created everything and science is just our trying to understand what God did type of thing." And so, when I put it in that frame instead of the first frame and then you start seeing all of what God has done, and it's just cool.

Harmony then offered an example, saying,

> In my lab, we have different subfields of robotics that people are working on. But a large one... is locomotion. And so, one of the big things is figuring out how to get a robot to walk on different types of terrain…it's an entire field that multiple people have been,

> working on and that's just one aspect of what us humans can do. That's just walking. And so, it's just amazing when I put it in perspective of science is us trying to figure out what's God has done because I'm like, we can't even figure out walking, how much more amazing is our God type of thing.

Harmony elaborated on how roboticists spent their entire careers attempting to get robots to adapt from walking on concrete to grass, or even ice, when God effortlessly equipped humans with such skills. For Harmony, science helped her appreciate God's ingeniousness all the more. Bridging their spiritual and scientific epistemologies freed Harmony and Taryn from feeling as if they had to choose one or the other; instead they could appreciate both.

Spiritual and engineering values. Participants also drew connections between their spiritual values and those espoused in their engineering professions. For several participants, such alignment helped them view their engineering work as an enactment of their spiritual values. For example, in Shanice's engineering discipline, ensuring the safety and well-being of others was at the center of her work, which aligned with her spiritual values that inclined her to care for others. She said,

> We even take on like user-centered design, so we keep the person kind of at the epitome of everything that we do. We form all of our rules, all of our processes, our systems around the people, their safety, their well-being. For me, that self-care, the doing everything that I can to protect the person or put the person first, maybe that's how my spirituality and my discipline kind of mesh together.

Similarly, Bree viewed engineering as a problem-solving profession that focused on attending to the needs of others. In the same way, her spirituality encouraged her to help others and spread love by caring for other people.

> I think my field, [is] kind of like a problem-solving field…So we're always trying to improve something, solve a problem. And like you said, what you've noticed about me is I'm always trying to help people. So, with my spirituality, it's like, I want to put the love into the world, and let others feel it, and I don't know, prosper from it. I want to gain something from it. So, it's like my field helps me do that.

Both Shanice and Bree viewed their disciplines of engineering as valuing helping other people, which was central to their spirituality. Caring for others was an expression of their faith that they could enact in their engineering work. Because Shanice and Bree perceived their engineering and spiritual values to be in alignment, they found their engineering work to be spiritually purposeful.

Divinely inspired engineering work. Finally, two Black women in the study shared examples of how their spiritual epistemologies and ontologies actually inspired their engineering work. Participants discussed how they received revelations about their work and research that could only be explained as divine interventions from God. Participants' spiritual ways of knowing and operating in the world allowed them to believe that God could provide valuable insights and answers to questions they may have been puzzling over in their research. For instance, when asked if she had ever had a breakthrough that she could not logically explain, Aliyah mentioned that she developed a novel method in her research that she believed God led her to create. After getting consistent results with her method, Aliyah presented it to her advisor who wanted to hear exactly how her new procedure was conceived, but Aliyah knew her response would not satisfy her advisor.

> And so sometimes when my advisor, he's just asking all these questions, he gets on my nerves, 'cause I'm just like "Everything isn't gonna be justified, and everything can't be

> justified", and oftentimes the academics just talk around to try to justify something that they really can't explain. And in certain ways, yeah—I just don't know. Well I know, but I can't explain why…And I just know it was God leading me, but that's just not something I can say in the environment I'm in.

Aliyah firmly believed that God showed her what parameters she needed to use to get reproducible results, which defied notions of rationality and logic deeply ingrained in her academic environment. Though Aliyah's method was unconventional there was no question that it worked, and could be widely adopted. Aliyah's spiritual epistemologies and ontologies were intrinsically connected to her engineering work, and led her to a breakthrough which she felt to be was divinely inspired by God.

Nadia also recounted a moment in her engineering doctoral program when she had a breakthrough idea regarding her research project. After months of using the same method yielded no promising results, Nadia had an idea to use an alternative method for her project that one of her colleagues had designed. Though her advisor was initially against Nadia trying an alternative method, Nadia decided to move forward with the experiment on her own, trusting her intuition. While she was at the airport, suddenly Nadia thought of applying her colleague's method to her project:

> I said "Wow, that would be a great idea, let me try in lab" like I literally just had a weekend, but I went home and did a quick experiment and it was the best part of my paper and it worked and [my advisor] said that she liked it… so coming up with that idea was spiritual because I relied on my own thoughts.

Nadia's spirituality encouraged her to trust herself and believe in her ideas. Having spent over a year listening to her advisor with little progress in her research, Nadia decided to take a leap of

faith and try something new. Like Aliyah, Nadia's spiritual ways of knowing inspired her engineering research and allowed her to find alignment between her spirituality and science.

Responses to Spiritual and Scientific Tensions

While several participants in the study were able to find alignment between their spiritual and scientific epistemologies and ontologies as they pursued their doctorates in engineering, a few found it difficult to reconcile the tensions they experienced in their programs. Moreover, those who found it difficult to address these tensions felt a disconnect between engineering and their life purpose. For instance, Kala shared that she viewed engineers as lacking a sense of spirituality, or some other motivating force that compelled them to do the work that they did.

> I don't think my field really has it. I've never felt as if the engineers around me have some type of faith or... I don't think it's spirituality or anything that drives them to do what they do or to think about the questions that they want to ask.

She contrasted this with her own motivations:

> I don't feel that…I like knowing that my work is impactful. I don't want to call it necessarily short-term gratification, but at least if I'm working with kids, I'm helping these kids, doing something. I know that if I'm working in a policy setting that this policy is going to help someone somewhere. That much I know.

She also reflected on the experience of working in engineering labs, which she sometimes found demoralizing and at odds with her reasons for pursuing engineering work:

> Being in the lab can be such a silo. It can be really draining and also very defeating. But sometimes triumphant. I don't see the spirituality in it, which is why I don't think I could do it for the long-term…I feel like engineers, they think differently. It's more so like the process, the process, the process. But not necessarily what's the motivation force behind

that? What's the driving force in the process? Those are the things I like to think about. And I don't think people around me think of those, not like that.

Kala desired to pursue a career path that she found spiritually purposeful, which she could not imagine in engineering. Noting Kala's use of "they" as she referred to other engineers, I asked what prompted her to distance herself from other engineers in that way. She responded,

> Yeah, because I don't want to consider myself an engineer. I feel like I'm a perpetrator. I would say it's loosely imposter syndrome because now I was just like, "if they can do this shit, I can do it." But I'm faking it until I make it. And I'm like I didn't have the same problem. I would say I'm a [scientist], but definitely no engineer. I'm just here. I act like it. On paper it says I have a master's in engineering.

Despite having earned her master's in engineering, and being in the midst of earning an engineering doctorate, Kala did not consider herself to be an engineer. She felt more connected to her identity as a scientist from her undergraduate training. Her motivations for earning her engineering doctorate were less about pursuing a career in engineering and more so about proving to herself that she could.

> I was thinking number one I don't want to leave [this university] without getting this degree. If I don't leave here with it, it's not because I didn't like fight tooth and nail to try. So, the only thing that could stop me, is somebody else. Even still, I don't think that will hinder me from doing the things that I would like to do in life.

Here, she explained discomfort with the assumption that earning a doctorate in engineering presumed a career in academia or industry:

> I was having a conversation the other day and [the people I was talking to] were pissing me off. Because I said that—they were like, "what are you going to do when you get your

> Ph.D.?" It's like the second person that has done this and I really don't like it. "You're not going to teach? Why would you get a Ph.D. if you're not going to go be a professor at some school? Why don't you go to industry?" Because I always say like if I get this Ph.D. and go to a grocery store, I'll be fine. I'll be a grocery store worker with a Ph.D. because having this Ph.D. is not about making money to me, it's not about having notoriety…No, getting this is a testament to myself that I did this…A dissertation, your check marks and your advancement is based on somebody else. Me getting through this is all for me. It's all to say I did it and I did it in my time and I accomplished it. Whatever I do afterwards is whatever the hell I want to do. But I don't have to be a professor. I don't have to go work at some engineering company. I don't have to do none of that if I don't want to.

Kala was perfectly comfortable with completing her doctorate and pursuing an alternative career path afterward because she did not identify with the engineering profession. She viewed the majority of engineers to be spiritually bereft, which was not how she saw herself. Further, she believed that her work in engineering would not allow her to make the societal impact she wanted to in her career. Kala's comments reveal how a clear disconnect between one's spirituality and the epistemologies and ontologies of one's academic community could be professionally demoralizing. It appeared, however, that Kala was not entirely averse to leaving the field though she was certainly considering it.

Though other participants saw more alignment between their spiritual and scientific epistemologies and ontologies than Kala, they nonetheless also struggled to see engineering as directly connected to their life purpose. When I first asked Lailah if engineering was linked to her sense of purpose, Lailah said "no"; she did not see them as related. She elaborated,

> I feel like [engineering is] more a job. Yeah, I also think I lost a little bit of the sense of being proud about pharmacy because I see how companies...People have cancer because they don't eat well or because they don't exercise, and those things lead to cancer as well. Or, the companies create those medicines, but they have all this bureaucracy that people don't talk about. So, I don't feel as passionate about this career side anymore as I used to. So maybe I'm a little disappointed [in] that route. But I came all this far, and then not doing anything.

From Lailah's perspective the pharmaceutical industry, which largely employed chemical engineers, profited from people's illnesses and that did not align with her spirituality. "It's everything about the money. It's about making profit. They also have ethical issues that could come up. So, I think those times, then it doesn't align." Yet, even in her disillusionment, she struggled with a decision to leave the field saying, "but I came this far, and then not doing anything…" In her final interview, Lailah shared that she believed that there should be people of faith in various industries, including engineering, to help spread the gospel of God. However, it seemed that she was still working through whether she saw her spiritual purpose as being connected to her engineering work. Reflecting on the question of whether her spirituality and her engineering work were connected, she hoped to find the linkage:

> I think my major can just help spread the gospel, but spread the gospel among engineers, because I remember how I said that then. I was like, "I don't think that they're very connected." But maybe it is. Maybe they are connected.

Though Lailah was beginning to imagine how her spirituality could inspire others in her field to find faith, she was still deciding where she fit in the field. For the time being, it was unclear how

her perception of a misalignment between her spirituality and the nature of engineering work would influence her career trajectory.

In contrast, Amaani knew that after earning her doctorate she would not continue her career in engineering. She realized she wanted to pursue a career path that would bring her joy, which she did not feel in her current field.

> I do feel like I have a sense of purpose, but I can't say that I know exactly what that purpose is. I just know that I need to go after what brings me happiness, what brings me joy, and what I'm passionate about. So, I ended up in engineering because that's kind of the path that I was put on at a young age. And I'm just like my purpose now is to not do that anymore, [it is] to now go after what I actually care about. Yeah. So, I don't know what that looks like in the end, what that will be in the end…I think my work in engineering has brought me here because I realize this is not what I want to do for the rest of my life…But having gone through this process of this Ph.D. has really forced me to be like, "No. You need to find something that you're going to be happy doing. Otherwise, you're not going to feel like you have purpose in your life."

For Amaani, engineering was a stepping stone along the path to discovering her true purpose.

Although she could see how engineering could align with one's spirituality, when Amaani was conducting research in her field she felt spiritually disconnected. She explained,

> When I'm thinking about research, I'm not usually thinking about God. When I'm thinking about the struggles I'm having doing research, I'm thinking about God. When I'm thinking about the results that I'm getting and the actual data, the things that I'm observing, I don't think about, "Oh, God did this. That's really cool." I don't think about that enough. I feel like I should.

Despite struggling to remain attuned to God as she was conducing her own research, Amaani could appreciate how the work she and other engineers were doing could reveal the ingenuity and creativity of God.

> At the end of the day, if you believe that God created everything, then He created the new therapeutics that you're working on at the bench, trying to develop…. You get another appreciation for everything that you discover in the lab or in your research. It's so cool to think that there is a being that orchestrated this complex multidimensional system that's so complex that it's been decades and decades of time for people to figure one little thing out of the way a cell works in this way, or whatever it may be. Yeah, I don't feel like they're in contradiction at all. I feel like they're aligned

Amaani's prompting to spend more time considering the ways her spiritual beliefs aligned with those of her engineering field came from stumbling upon her advisor's dissertation acknowledgments. In it, she saw a line that referenced the marvelousness of God's creation which surprised her, "It was a complete shock, because [my lab mates and I] have never, we didn't know that he was at all religious, let alone I guess religious enough to put that in his dissertation." When asked how seeing that acknowledgement at the beginning of her doctoral program versus near the end may have influenced her perceptions of her field, or even her advisor, Amaani replied,

> I think that it would have definitely shifted the way that I separated work research from faith, which I kind of put in my personal life box. Knowing that [my advisor] presumably relies on his faith, but knowing how invested he is in our work and in research, would have... I don't know, it would have been interesting to, I think, be aware of that. I mean, I

> don't know if that would have changed the way that I went about things. I don't know if it would have changed anything, but I definitely do wonder about that.

Learning that her advisor held spiritual beliefs challenged the assumptions she made about him, and other engineers in her field. Until that point, she felt that the majority of engineers, including her advisor, were irreligious.

> I feel like most people are not religious in my field…I think that people who are in science just often, like I mentioned earlier, view things from a logical and methodological scientific process standpoint. So, they've come to the conclusion, or the decision, that they don't believe that there's a God. Maybe they kind of believe there's a God, but they're just going to live their life the way that they want to and not really think about it too much.

Whether the knowledge of her advisor's spiritual beliefs would have influenced Amaani's decision to pursue an alternative career after her doctorate remains unknown. Yet, she wondered if seeing that simple line in her advisor's dissertation acknowledgment earlier might have changed her doctoral experience in engineering.

Kala, Lailah, and Amaani experienced varying degrees of tension between their spiritual and scientific epistemologies and ontologies, particularly regarding their actual engineering work. While Kala found engineering to be overly concerned with process rather than purpose, she readily distanced herself from even identifying as an engineer. Although Lailah could see the need for spiritual people to be present in industries such as engineering, she did not experience engineering work in itself as spiritually fulfilling. Finally, though Amaani was still in the process of discovering her purpose, she had determined that engineering was not the career path for her. However, learning that her advisor could have been a man of faith, prompted her to spend more

time considering how her spirituality and science were aligned, and what that knowledge may have meant for her perceptions of her own engineering work throughout her doctoral program. These participants' experiences raise questions about how unaddressed tensions between Black women's spiritual and scientific epistemologies and ontologies may influence their ability to find purpose in their engineering work.

One participant in my study viewed her spirituality and work as an engineer as completely separate, but nevertheless imagined engineering as a pathway toward her life purpose. When asked how the nature and beliefs of her field aligned with her spirituality, Cadence replied, "I think I've always kept them separate…Yeah, I don't really see them as being related. I see them as very separate things in my mind." Elaborating on what contributed to this perspective, Cadence said,

> I guess I see my work as kind of being impersonal, I think in some ways ... it's more ... kind of like aligned with academia and I see academia as this very cold, stoic kind of entity, and I see spirituality as being more open arms and more...people-focused, more people-centric.

In prior interviews, Cadence spoke of helping others and being connected to people as central to her spirituality. Her perceptions of engineering work as impersonal, "cold," and "stoic" contrasted with Cadence's core spiritual epistemologies and ontologies. Although she compartmentalized her spirituality and engineering work, Cadence did not perceive them to be in conflict. She believed her spiritual purpose in life was to help other people, and she could see pursuing that purpose in an engineering career if she became a professor.

> I guess remembering I have a purpose that I felt that's been given to me by God to go out and help people, and the best way I can do that is being a mentor. So, one possible role is

> becoming a professor so that's my current objective and what my objective was throughout undergrad. So, just remember that purpose has helped kept me, I guess, persistent academically.

Although it was challenging for Cadence to bridge her spirituality and engineering work as a doctoral student, she could imagine engineering being aligned with her spiritual purpose in the future. Her ability to imagine fulfilling her purpose later in her career mitigated the need to find alignment between spirituality and engineering during her doctoral studies and allowed her to remain persistent in pursuit of her goals.

Finally, two participants actively strived to reconcile the tensions they experienced between their spirituality and science. Aligning their faith with their engineering practice helped these participants remain balanced and hopeful that there was a divine purpose guiding their engineering work. Although Taryn was still learning how manage the demands of her doctoral program while continuing to grow spiritually, she found ways to live out her faith in her engineering environment. She shared,

> I feel like religion should not be just be a religion. It should be something that you practice. And so, you should live those moral values. If the flow of the current goes against the moral values, you're going to have this discordance between your physical self and spiritual self and that does not feel great. That definitely needs to be patched up somehow. You definitely have to find the balance for you. And if that means rather than saying, "I'm lucky", [instead saying] "I'm blessed," or "Look at God" or things like that, then you gotta bring that out however you can.

In choosing to say she was blessed, rather than lucky, or acknowledging God when her research and academic work were going well, Taryn reminded herself and asserted to others that God was

in the midst of her engineering experience. Incorporating signs of her faith in her communication with others helped Taryn find harmony between her "physical and spiritual self," by keeping her attuned to the ways God was operating in her engineering work and academic environment.

While Aliyah recognized that there were tensions between her spiritual epistemologies and those espoused in her engineering environment, she was encouraged by the fact that she knew other people of faith in her field, which gave her hope that she also could find purpose in her engineering work. She said,

> But I do believe there is a point where that just ... I can't know all the answers. And I feel like in a way...sometimes I think you can't limit God into something that you can understand. And so, I feel like a lot of times, even in my worship, it's always for us to try to better understand Him. So, we do all these things as a way to better understand. But sometimes you have to realize everything is not meant for you to understand. Because He's all knowing. He's all powerful. He's omniscient. So, everything is not for you to understand. So, I feel like sometimes it could be a little bit at odds. But I also know a lot of believers in my field. And so that gives me encouragement and hope that God can still use me in this field that I know. And His will can still be done, even if everyone won't acknowledge that it's His work.

Although in other interviews Aliyah clearly expressed frustration with more rigid, positivist ways of thinking in her field, she could still see a place for herself in engineering. Furthermore, she was empowered by the knowledge that other spiritual people pursued and succeeded in engineering careers. Even if the engineers in her immediate academic environment did not appear to be people of faith, her awareness that there were other believers in the field kept her motivated to discover her purpose in engineering.

Summary

This chapter highlights both the tensions and areas of alignment Black women in the study discussed regarding their spiritual and scientific epistemologies and ontologies. The tensions participants experienced in their doctoral programs were often products of engineering cultures. Such tensions were practical (e.g., balancing doctoral program demands with their spiritual practices), regarding ethos (e.g., perceiving engineering environments to be competitive and unsupportive), ideological (e.g., engineering as adopting more positivist ideologies), and professional (e.g., not seeing one's engineering work being aligned with their spirituality). However, participants were also able to find areas of alignment when they bridged their spiritual and scientific epistemologies, made connections between their spiritual and professional values, and viewed their engineering work as being divinely inspired. Moreover, the degrees to which participants were able to reconcile their spiritual and scientific epistemologies and ontologies may have implications concerning their career trajectories in engineering. While actively reconciling or compartmentalizing one's spiritual and scientific ways of knowing and operating in the world appears to have contributed to some participants' persistence in engineering, not seeing areas of alignment or finding one's engineering work to be spiritually purposeful appears to contribute to other participants' considerations or decisions to leave the field. In the poem that follows, I highlight some of the tensions Black women in the study described and how some began to reconcile these tensions as they considered how engineering may be aligned with their life purpose.

It is cold here
Sterile
Dark
My warmth
My vibrance

My light dims here

Where I delight in the mystery
Find truth in the unknown
Those near me hunt for answers
Attempting to equate life with equations
Squeezing infinity into a symbol
And losing sight of the sacred for manmade solutions

Though we sit side by side, we don't see the same problems
Can't comprehend the other's confusion
For where they see a discovery in the making
I see an adept Author keeping audiences guessing
With awe and great admiration, I read on
Knowing everything couldn't possibly be revealed in this chapter
Perhaps not even this book

So, how did I get here?
Was it by accident or design?
Smiling to myself,
I realize
My devotion to this Author and love of mysteries has led me to this place
To build bridges between fact and faith
Reason and revelation
Spirit and science

What if I were made for such a place?
To ignite and enliven
Illuminate and inspire
Maybe this is exactly where I am meant to be…
I suspect the Author knows
I must read on and see

CHAPTER 7

Discussion, Implications, and Conclusion

This study explored the role of spirituality in the lives of Black women who identify as Christian and who were pursuing doctorates in engineering at one historically White and two historically Black institutions. Understanding how, and the extent to which, Black women's spirituality serves as a resource in navigating their predominantly White and male engineering fields valuably contributes to research and practice concerning the success and persistence of Black women in STEM. Moreover, this study centers Black women's spiritual ways of knowing and operating in the world, which is often overlooked and delegitimized in STEM fields. The specific research questions guiding the study included: 1) How do Black women understand and describe their spirituality? How, when, where, and with whom do Black women express their spirituality? 2) To what extent, and in what ways, does spirituality inform resilience, resistance, and transcendence among Black women pursuing engineering doctorates? 3) How, if at all, is spirituality implicated in Black women's work as engineers? To what extent do Black women in engineering experience conflicts between spiritual and scientific epistemologies?

Through a series of semi-structured interviews, as well as journal entries and photo elicitation, collected over the courses of six months, 16 Black women articulated the centrality of spirituality in their navigation of and persistence in their engineering doctoral programs. Findings of this study contribute a new and necessary perspective to the extant literature

regarding Black women's experiences in graduate STEM education through an examination of spirituality as a key cultural asset for Black women of faith pursuing doctorates in engineering. The study also makes a theoretical contribution to the scholarship on spirituality through its depiction of the ways in which Black women participants conceptualized and enacted their spirituality. Additionally, the study offers important practical implications with respect to the projected career pathways of Black women in engineering as they work to reconcile their spiritual and scientific epistemologies and ontologies. In this chapter, I situate my discussion of study findings in the current literature, provide implications for practice and research, and offer concluding remarks.

Black Women Conceptualizing and Enacting Spirituality

The descriptions of spirituality offered by the Black women in this study highlighted dynamic interrelationships among the self, transcendent forces, and others that were central to their understandings of faith. Regarding the relationship between self and transcendent forces, or higher powers, participants spoke of how their identities as Black women influenced their perceptions of God and themselves in relation to God. They shared how God could be a woman, and more specifically a Black woman. Further, these women discussed reinterpretations of the Bible that led them to believe that they could be directly descended from God as Black Israelites. In these re-imaginings of God and themselves in relation to God, Black women in the study were engaged in spiritual counterstorytelling. In critical race theory, counterstorytelling centers the lived experiences of People of Color in an effort to challenge or disrupt dominant narratives (DeCuir & Dixson, 2004; Ladson-Billings, 1998). Spiritually, the Black women in this study countered dominant narratives in American society that depict God as White and male, and early

Israelites as White. In doing so, they found ways to see themselves in their faith; their counterstories served to deepen their spirituality.

When discussing the relationship between self and others, participants took up notions of respect, dignity, and justice in their interactions with other people. Participants spoke of how their spirituality informed their treatment of other people, as guided by spiritual teachings (e.g., being kind, caring for others). They also mentioned how their faith encouraged them to remain sensitive to injustice and work to support the causes of oppressed people in society. For instance, as Amaani considered her own marginalization as a Black woman in the U.S., she began to align herself with plights of other marginalized people, which in turn led her to distance herself from her former predominantly White, conservative Christian community. Amaani felt that her previous fellow congregants ignored issues of injustice, which conflicted with her emerging political values and created tension in her relationship with God. With that community being the site of her spiritual upbringing, Amaani had to learn how to disassociate from that group and maintain her own spirituality. Amaani's experience harkens back to the CRT tenet concerning the commitment to social justice, which critical race scholars assert is integral to transformational resistance (Solórzano & Delgado Bernal, 2001). Amaani's spiritual understanding of the relationship between self and others included a commitment to social justice both interpersonally and societally, resultingly causing a rift between Amaani and her childhood church community that did not espouse the same values.

Participants also elaborated on the connection between God and others, which encouraged Black women in the study to love, help, forgive, and create community with others. Being led by God's example and their spiritual values, participants shared how they demonstrated God's love toward other people in their daily lives. They noted, however, that

others in their academic communities, did not or might not share their faith and might believe that people of faith are less intelligent. Some participants responded to this concern by being less open about their beliefs in the company of other engineers.

Addressing the research question of how participants express their spirituality, Black women in the study highlighted spiritual practices such as prayer, reading religious material, communing with other believers, and worship, which gave them insight regarding how to live out their beliefs. This finding aligns with current research findings that discuss the importance of prayer (Bacchus & Holley, 2004; Mattis, 2002), worship, and fellowship with others (Banks-Wallace & Parks, 2004) as being important aspects of Black women's spiritual practice. Much like the Black women in Wallace and Parks (2004) study, participants in this study spoke of prayer as an opportunity to commune with God. Additionally, similar to the Black women professionals in Bacchus and Holley's study (2004), participants received much needed faith-based support and inspiration to continue their degree pursuits from their friends, relatives, and faith communities. Like the African American college women in Patton and McClure's (2009) study, these Black doctoral students also relied on religious texts to help overcome adversity and for encouragement. When Celeste felt overwhelmed and discouraged about her graduate studies, reading the book of Job in the Bible gave her perspective and motivated her to press on.

Participants enacted their spirituality at various times and places, but commonly incorporated their spirituality and spiritual practices in their daily routines, and were especially attuned to their spirituality in times of trouble. Thus, my participants' expressions of spirituality were not limited to places of worship, but occurred in personal, academic, and professional contexts in the company of those they trusted, as well as in private. In private, Black women in the study felt comfortable enacting their spirituality through prayer, worship, or reading religious

material in their labs, offices, or other academic spaces. Their ability to express their spirituality in these secular academic contexts demonstrates how participants' spirituality was not confined to certain spaces. Yet, the people they shared those spaces with mattered. In the company of engineering faculty and peers, participants described feeling pressure to be productive and on-task, or being inhibited spiritually by competitive, unsupportive cultures. As spiritual people, my participants carried their spirituality with them in various contexts, yet their sense of comfort publicly enacting their spirituality depended on whether they felt free to do so without judgement and criticism. The same principle applied in spiritual contexts. For instance, when Shanice became distracted in her place of worship with thoughts of how others might be perceiving her and her family, she valued private spaces where she could pray and read religious material before starting her day.

Conceptualizations and enactment of spirituality by study participants illuminate the ubiquitous nature of faith in their lives. Aligned with Mbiti's (1990) assertion that spirituality is imbued in all facets of life for people of African descent, participants in the study described how their faith informed their decisions, meaning making of experiences, treatment of others, understandings of themselves, and life purposes. Spirituality informed how Black women in the study saw, understood, and operated in the world, including within their academic environments.

The significance of spirituality in participants' lives encourages further study of the role of faith for Black women in STEM disciplines. Notably, all 16 participants in this study subscribed to Christianity. Future research should investigate how Black women of other religious backgrounds conceptualize and enact their spirituality. Researchers should explore if and how Black women from different faith traditions have similar understandings of spirituality. Further, research should explore whether or not Black women of other faith backgrounds have

similar experiences in other STEM cultures, and if they also attempt to reconcile tensions between their spiritual beliefs and scientific epistemologies. Additionally, Black women's critical understandings of spirituality that implicate social justice and offer counterstories of God and Black people in relation to God warrants further examination. Specifically, Black women in the study discussed being attuned to the plights of other marginalized people in society and being committed to aligning themselves with socially just causes. Participants also articulated perceptions of God that defied patriarchy and normative whiteness, by choosing to imagine God as a woman, and/or a Black woman specifically. Examining Black women's motivations for and manifestations of their critical perspectives of spirituality can provide deeper understandings of Black women's complex conceptualizations of faith.

Navigating the Tunnel: Black Women's Experiences in Engineering Doctoral Programs

Pursuing doctorates and navigating engineering environments presented various challenges for participants. A telling metaphor, Black women in the study described, at various points in their doctoral journeys, searching for the light at the end of the tunnel. While in their engineering doctoral programs, they combatted feelings of not belonging and of being imposters in academia, as well as mental health concerns and experiences of discrimination. They attributed these challenges primarily to competitive, socially isolating departmental cultures, and Black women's underrepresentation in these environments. Even in historically Black institutions participants mentioned being one of few, or the only, Black women in their engineering departments. Further, as critical race theorists assert, the endemic nature of racism in U.S. society (Ladson-Billings, 1998) pervades academic environments, specifically those in historically White institutions. Though participants found it difficult to explicitly name their treatment from peers and faculty members as racist, they recounted memories of being

disrespected, invalidated, underestimated, and undermined by members of their engineering departments. Legacies of oppression appeared to shape the academic spaces in which participants pursued their educations, even if these legacies operated in covert ways. According to Harris (1993), whiteness functions similarly to property in that it can be possessed, used, enjoyed, and controlled. The property value of whiteness was evident for participants in both historically Black and White institutions, for example in the ways in which "whiteness" could be conferred upon people of East and South Asian descent. Some of the Black women in the study described experiences of differential treatment between themselves and their peers. Some participants felt as if their research advisors did not see the same level of potential in them as their White, East Asian, and South Asian peers, and therefore they were not privy to the same resources and mentorship. Nadia, for instance, observed that faculty in her department did not give marginalized students the same benefit of the doubt assigned to White students. Additionally, Aliyah observed that in her department it seemed that only White and Asian men were equipped to thrive by virtue of the institutional support they received. These examples reveal how "White" maleness, in particular, appeared to hold substantial power in participants' engineering environments.

Another example of whiteness as property is revealed in these Black women's feelings of being disenfranchised in spaces where they were sorely underrepresented. Participants felt unwelcome in certain spaces within their engineering environments, and subconsciously seemed to internalize an understanding that they did not belong in spaces that were frequented by their non-Black peers. In a literature review examining the ways in which racial and gender disparities have propagated in STEM fields, Carter, Dueñas, and Mendoza (2019) discuss how engineering

academic environments may also be racialized and masculinized in the interest of White men. The authors write,

> The physical space of a department can also feel exclusionary if only White men's pictures are centered as being important contributors to scientific inquiry. Some academic spaces include artifacts and pictures of application of the discipline in the world: if these also tend to represent a certain kind of masculine, "geeky" set of interests or priorities, they also can dissuade others from being interested in the major. (p. 77)

For some of the women in my study, it appeared that Black women's lack of representation in their departments sent a message that they did not belong and perhaps fed perceptions that they were unwanted in these environments. The critical race concept of Whiteness as property, coupled with the persistence of racism, suggests that these Black women doctoral students may have received a variety of signals that indicated they were unwelcome—from microaggressive encounters with peers and faculty to a lack of institutional intentionality in recruiting and retaining more Black women in their engineering departments. Taken together, such signals relayed an insidious message that Black women were outsiders in their academic environments.

Mental health concerns also posed significant challenges for Black women in their engineering doctoral programs. Multiple participants expressed symptoms of depression ranging from having difficulty getting out of bed to experiencing suicidal ideation. Woods-Giscombe et al., 2016 suggest that Black women who adopt superwoman schemas may be more inclined to rely on their spirituality and less inclined to seek professional help in coping with mental health concerns. Participants in this study mentioned how their spirituality encouraged them to attend therapy or find other sources of support, including spiritual counseling. Although one participant did not seek professional support when she was experiencing symptoms of depression, she

discussed how her faith helped her realize that her life was a gift and she had a purpose to fulfill in the world. It appeared that the participant's faith did not prevent her from adopting help-seeking behaviors, but rather encouraged her to help herself through the recognition that her life had meaning. Future research is needed on the relationships between spirituality and mental health for Black women in engineering to better understand the influence of faith on help-seeking behaviors and supporting Black women's mental health.

Despite the challenges that Black women encountered in their doctoral experiences, their spirituality empowered them to engage in resistance, remain resilient, and transcend obstacles in pursuit of the light at the end of the tunnel. Participants relied on their spiritual beliefs to exercise agency in their programs. For instance, Lailah's decision to participate in community service against her advisor's advice was motivated by her spirituality. Helping others was central to her enactment of her faith and kept her grounded during her doctoral program. Other participants were emboldened by their identities as children of God and convictions that they could resist adversaries spiritually through practices such as prayer, listening to sermons, and reading religious material. Participants' spirituality helped them actively resist messages from advisors, faculty members, and peers that could undermine their worth as people or engineers. However, Black women in the study were still able to get the knowledge and information that they needed from these individuals in order to succeed in engineering. This is an important contribution to the current literature on the socialization of Black graduate students in STEM fields, because in literature to date there is discussion about how Black and other marginalized students' negative encounters with authority figures and peers in their fields may lead them to disengage with STEM, or dis-identify themselves as professionals within those fields (Gay, 2004; McCoy, Luedke, Winkle-Wagner, 2017). With the exception of Kala, this was not the case for

participants in the study. Kala explicitly stated that she did not see herself as an engineer, however, she still recognized herself as a scientist which meant there was not a wholesale departure from STEM. Further, Kala did not say definitively that she intended to leave engineering. Participants' discussions of spiritual resistance sheds light on how spirituality could be a critical asset for Black women of faith in oppressive academic environments. Black women in the study were empowered by their faith to assert themselves in their advising relationships, prioritize activities they found meaningful outside of their academics, and contend with threats to their well-being.

Participants also remained resilient in their programs through the spiritual support of their families and loved ones. Having their communities pray for them, or offer spiritually-based encouragement helped uplift participants during low points in their programs and kept them focused on achieving their goals. In addition, pivotal moments of validation, perceived as answered prayers from God, contributed to participants' resilience. These findings align with scholarship that details how spirituality helps Black women collegians engage in resistance, spiritual sense-making, and remain motivated in their educational pursuits (Cannon & Morton, 2015, Constantine et al., 2006, Donahoo, 2011; Patton & McClure, 2009; Watt, 2003). Relatedly, Burt, Williams, and Palmer (2018) also noted the importance of faith-based communal support in contributing to the persistence of Black men in engineering graduate programs. Further, findings from this study extend research regarding the importance of familial and communal support for Black women in STEM (Ong, Wright, Espinosa, & Orfield, 2011), by discussing how participants' communities specifically offered faith-based support in trying times. Spiritual encouragement from friends and family members helped participants not only feel connected to those people, but also to God, which strengthened participants spiritually.

Finally, participants transcended challenges in their academic environments by remembering the faith of their ancestor's as they overcame various forms of oppression and trusting that God would enable them to overcome also. Participants' ability to see linkages between their ancestors' spirituality and their own helped them tap into legacies of faith when they were feeling discouraged. Stewart (1999) described a "soul force spirit" that ingrains within Black people a will to survive and remain whole in the face of threats to their well-being and existence. Some participants in this study felt intimately connected to the struggles of their forebears, and also to their unrelenting faith in the midst of oppression. Furthermore, some participants expressed an awareness that their ancestors' faith contributed to their ability to pursue doctorates in engineering. For instance, Taryn felt that she was standing on the prayers of those who came before her and believed better opportunities would be available to the generations after them. Relatedly, Michaela viewed the spirituality of her ancestors to be a form of capital that could be passed down to the generations that followed. In this study, I refer to such capital as spiritual capital. Writing from a business and organizational perspective, Zohar and Marshall (2004) have previously defined spiritual capital as,

> Capital earned from serving deep meaning, from serving a deep sense of purpose and from serving fundamental human values. It is a kind of capital initially measured not in dollars and cents but rather in the sense of achievement, the high morale, the gratitude, and the general increase in well-being that accompany raising the quality of human life. (p. 24)

However, based on my participant's comments, I would suggest that spiritual capital in a cultural sense describes an inheritance of faith rooted in histories of survival in spite of oppression that inspires strength and resilience in times of challenge. For example, Michaela believed that her

ancestors' faith helped them survive the dehumanization of slavery, and that same faith was passed through the generations to empower descendants such as herself to overcome challenges in their time. Altogether, these findings indicate the spirituality is a powerful asset for Black women of faith as they navigate the tunnels of their engineering doctoral experiences. For the women in this study, faith gave them hope for the light at the end of the tunnel, and imbued them with strength to endure the challenges therein.

Black Women's Spiritual Epistemologies and Ontologies

Regarding my final research question, this study illuminates how participants' spiritual epistemologies and ontologies were implicated in their engineering work and doctoral program experiences along with the tensions participants felt between their spiritual and scientific ways of knowing and operating in the world. Within engineering and STEM disciplines more broadly positivist epistemologies that emphasize the legitimacy of rationality, logic, and objectivity as good science, prevail. Harding (2005) describes the tenets of positivism as "belief in the high value of scientific knowledge over every other kind of knowledge, in the importance of good method in achieving scientific knowledge, and that such good method inevitably makes a necessary contribution to social progress" (p. 346). These tenets not only presume the superiority of scientific methods in knowledge production but suggest a delegitimization of alternative ways of knowing, such as Black women's spiritual epistemologies. Although participants in my study continued to practice the scientific methods they were taught in their engineering doctoral programs, they maintained that their spiritual epistemologies were also valid sources of knowledge and questioned whether the approaches valued in their academic environments were as objective as they were claimed to be.

Laden in positivist epistemologies are understandings that science should be separate from political, social, and cultural concerns that could bias scientific processes (Harding, 2005). Further, what is considered to be rational, and thus valid, knowledge in the sciences is determined by the scientific community itself. Harding (2005) writes:

> Positivism asserts that only the rational accounts of science are those that come from the scientific community itself and its philosophic wing. It tends to see the more realistic accounts produced by the social justice movements as caused by ignorance, the impetuousness and false thinking of political groups (mob rule), and individual psychological malfunctioning. (p. 359)

I would argue that it is actually a subset of the scientific community which determines what is rational, being that underrepresented and minoritized members of this community have been silenced in contrast to their dominant peers. Critical race theorists observe that members of the dominant group "construct reality in ways that maintain their privilege" (Ladson-Billings, 1998, p. 14)— thus, positivistic epistemologies that divorce science from social and political concerns privilege members of the dominant group, which in the scientific and engineering communities in the U.S. is White men. As such, alternative ways of knowing that honor the realities of People of Color may be readily dismissed as illogical, irrational, and lacking objectivity.

Hill Collins (2000, 2009) asserts that the pursuit of rationality by positivist scholars encourages distancing from their individual identities, experiences, and values:

> Positivist approaches aim to create scientific descriptions of reality by producing objective generalizations. Because researchers have widely differing values, experiences, and emotions, genuine science is thought to be unattainable unless all human characteristics except rationality are eliminated from the research process. By following

> strict methodological rules, scientists aim to distance themselves from the values, vested interests, and emotions generated by their class, race, sex, or unique situation. By decontextualizing themselves, they allegedly become detached observers and manipulators of nature…(pp. 273-274)

Positivists thus argued for the necessity of removing emotion from the research process, deeming ethics and values to be inappropriate as the reason for, or guiding one's approach to inquiry, and using adversarial debates as the "preferred method of ascertaining truth" (Hill Collins, 2009, p. 274). Whereas these strict forms of positivism argued that one can be value-neutral through the imposition of strict methodological requirements that distance the researcher from the "object" of study, later forms of "post-positivism" argued that while values could reasonably guide the choice of research questions – I value human life therefore I wish to work on a cure for cancer – the researcher must remain objective in terms of method and data interpretation (Phillips & Burbules, 2000). Both views nonetheless can conflict with epistemologies of communities that have been marginalized in science and engineering. Hill Collins argues (2009), "such criteria ask African-American women to objectify ourselves, devalue our emotional life, displace our motivations for furthering knowledge about Black women, and confront in an adversarial relationship those with more social, economic, and professional power" (p. 274).

Participants in my study encountered such pressures in their engineering programs as they contended with cultural norms shaped by positivist epistemologies such as prioritizing research over self-care—including engagement in spiritual practices—and striving to prove themselves in highly competitive, unsupportive academic environments. Yet, even as my participants continued to work within these environments, they found ways to enact their spiritual epistemologies and ontologies. Hill Collins (2009) suggests that historically, Black

women in sociology faced similar epistemological constraints in their field, but also seized opportunities to challenge positivism when they could:

> In order to refute the history of Black women's unsuitability for science, they had to invoke the tools of sociology by using positivistic frameworks to demonstrate their capability as scientists. However, they simultaneously needed to challenge the same structure that granted them legitimacy. Their responses to this dilemma reflect the strategic use of the tools of positivism when needed, coupled with overt challenges to positivism when that seemed feasible (p. 274)

Likewise, Black women in my study applied the tools of positivistic epistemologies, while remaining attuned to their spiritual epistemologies in their lives inside and outside their engineering doctoral programs.

According to Cech (2013) two additional ideologies prevalent in engineering— depoliticization and meritocracy— contribute to tension between scientific ways of knowing and cultural values that are not rooted in such ideologies. Cech (2013) defines depoliticization as "The belief that engineering work, by definition, should disconnect itself from social and cultural realms because such realms taint otherwise pure engineering design methodologies" (p. 71). In addition to rendering "culturally invisible" the reality that all engineering work has social and political foundation, the ideology of depoliticization "means that aspects of social life that have to do with conflicting perspectives, cultural values, or inequality are cast as 'political' and thus irrelevant—perhaps even dangerous—to 'real' engineering work" (p. 71). In my study, Black women engineers resisted ideologies of depoliticization in their academic environments through their commitment to their spiritual epistemologies and ontologies.

Participants in my study applied spiritual principles to their engineering work, believing that engineers should be concerned with inclusivity, equity, and accessibility in their engineering designs. Parker argued that if God is accessible to anyone who desires a relationship, then engineers should be intentional about designing products that can be used by all types of people regardless of their race or gender. Lailah believed that engineers in her discipline were more concerned about profit margins than helping sick people get well, and although this contributed to her perception that her spirituality and engineering work were misaligned, she saw the possibility that engineers of faith could perhaps spread the gospel of God to unbelievers in the field. Furthermore, as Lailah struggled with the moral implications of conducting experiments with animal subjects, she considered the potential contributions to the development of drugs that could cure human diseases, thus reconciling the moral tensions she felt conducting her research by prioritizing her spiritual principle of helping others.

Relatedly, in conducting interviews with engineering faculty members, Pawley (2009) found that engineers commonly distinguished their work from that of scientists asserting that engineers solved problems that mattered, helped "society" (often poorly defined), and were useful. Yet, as Pawley (2008) reveals in another study, engineers' definitions of society largely depended upon the geographic locations in which they were situated and populations therein; thus, faculty members' perceptions of who engineers serve also reflected a catering of engineering solutions to the "rich and powerful" (p.77). This was not the case for participants in this study, who desired to develop engineering solutions that were inclusive and accessible to those in need.

Cech (2013) further describes the role of meritocracy in shaping the epistemology and ontology of engineering culture. Defining meritocracy as " the belief that success in life is the

result of individual talent, training, and motivation, and that those who lack such characteristics will naturally be less successful than others" (p. 73), Cech (2013) argues that "If inequality is the result of individual failings, then the profession of engineering neither plays any role in that inequality, nor has any responsibility to attempt to rectify it" (p. 75). Participants' in this study also contended with – and countered – meritocracy. Women in the study took up social issues within their academic environments by being critical about the differential treatment they experienced from their advisors in comparison to White, East Asian, and South Asian peers. Some participants responded to such treatment by engaging in spiritual resistance, for example, asserting themselves in their advising relationships and recognizing that they were worthy of respect as children of God. Additionally, participants' relational conceptualizations of spirituality kept them attuned to the roles of God and other people in their lives, rather than solely ascribing their achievements to their own merit.

Women in the study were both explicit in naming the spiritual-based support they received from family and friends, and in their attributions of much of their success to God. Such attributions were particularly apparent when participants experienced key moments of validation in their programs, such as receiving awards, fellowships, or other forms of recognition. Further, participants' beliefs that ideas and scientific breakthroughs could be divinely inspired by God denotes an understanding that what is accomplished in science is not simply a matter of individual talent and motivation, but rather a testament to God's revelation of knowledge to humankind. In sum, Black women in the study espoused spiritual epistemologies and ontologies that were neither apolitical or individualistic, but socially conscious and relational.

Participants also shared how their spirituality motivated their commitments toward social justice. For some, this manifested in their spirit-driven community outreach efforts to encourage

racially underrepresented and minoritized students to pursue STEM educational opportunities. Others were interested in aligning themselves with the causes of marginalized people societally, which inspired conversations with their engineering peers concerning racial injustice and other forms of discrimination.

As Hill Collins (2000) and Harding (2006) assert, epistemologies that pervade the sciences appear to privilege White men and marginalize People of Color. The epistemological and ontological tensions Black women in the study expressed reflect the struggle of embodying alternative ways of knowing and being in unreceptive, predominantly White and male disciplines. Black women's spiritual epistemologies and ontologies promoted collectivism, theism, and the pursuit of vocation rather than occupation, which contradicted cultural norms of individualism, irreligiosity, and work divorced from purpose that they perceived in their engineering environments.

In spite of these tensions, Black women in the study found areas of alignment when they bridged their spiritual and scientific epistemologies, linked their spiritual and professional values, and perceived their actual engineering work as being divinely inspired. While this alignment helped the majority of Black women in study find purpose in engineering, participants had to make these connections for themselves. In a study of indigenous college students in science, engineering, and health fields, Cech, Metz, Smith and DeVries (2017) found that the responsibility for finding congruence between native epistemologies and those of their academic fields was left to students. Although native epistemologies were delegitimized in their academic environments, students resisted such scientific cultural norms. One participant described how he could apply engineering epistemologies to the priorities of his tribe, while others spoke of remaining open to the possibilities of learning new things, but remaining true to themselves and

their traditional practices. Some women in this study, however, were unable to reconcile or compartmentalize the tensions they experienced between their spirituality and science, or to find purpose in their engineering work, and considered alternative career pathways outside of engineering. Research is needed to investigate the relationship between Black women's reconciliation of other spiritual and scientific epistemologies and ontologies and their persistence in engineering beyond graduate studies. Further, engineering doctoral programs should consider how they may assist Black women—and others— in reconciling their spiritual and scientific epistemologies and ontologies. Shifting pedagogical approaches, cultures, and climates in engineering to acknowledge and affirm alternative ways of knowing, rather than delegitimizing them would be a useful starting point.

Revisiting the Conceptual Framework

As postulated in the conceptual framework of this study, participants at both historically White and historically Black institutions experienced the pervasiveness of racism, and particularly gendered racism in engineering. Participants at both institutional types confronted challenges with a lack of belonging, imposter syndrome, mental health concerns, and discrimination. I suspect that the similarities in participants' experiences at the historically White and historically Black institutions reflects the nature of engineering doctoral programs and the field itself. Though some of my participants were enrolled in historically Black universities, they still studied and worked in engineering departments and programs, which are situated in the broader context of engineering as a discipline and profession. The work of engineers (e.g., problem solving, making things) and epistemologies prevalent in the field (e.g., positivism, rationality, meritocracy) remain consistent across both institutional types, which may also contribute to participants' similar experiences at their respective universities. Additionally, Black

women remain underrepresented in engineering higher education, particularly at the doctoral level in the U.S. (NSF, 2019). Thus, even in historically Black institutions, Black women can experience the materiality of their underrepresentation in the field. Like their peers at historically White institutions, participants in historically Black institutions were still one of few or the only Black women in their respective departments and research labs which may have contributed to challenges experienced in their engineering doctoral programs.

In alignment with the conceptual framework, findings from this study illustrated how the property value of whiteness may be conferred upon other People of Color demonstrating academic prowess in engineering. Participants' perceptions that men of East and South Asian descent, in particular, received similar privileges to White male colleagues revealed how the CRT concept of whiteness of property can be extended beyond the Black/White binary. Specifically, this finding demonstrated how other People of Color could be implicated in the exercise and maintenance of power and privilege in engineering academic contexts. This conferral of "whiteness" to other non-Black, People of Color served to exclude Black women from comparable access to resources, opportunities, and recognition for their contributions.

However, participants' spirituality provided clear assets that helped Black women in the study engage in resistance, resilience, and transcendence of obstacles in their engineering doctoral programs. Black women in the study also spoke of the importance of faith-based communal and familial support in the pursuit of their academic goals. Yet, there were also a few cases of participants distancing themselves from the spiritual communities of their childhood as a result of evolving spiritual epistemologies and ontologies. For instance, Amaani growing detached from the conservative church she was raised in due to her burgeoning commitments to social justice and the plights of marginalized people. Of note, Black women did experience some

tension between their spiritual and scientific epistemologies and ontologies, but several participants found alignment between their spirituality and engineering, or were able to reconcile the two. As suspected, the women who were able to reconcile their spiritual and scientific epistemologies and ontologies did find a sense of purpose in their fields and felt more committed to their academic pursuits.

Implications

As this study demonstrates, spirituality played an integral role in the lives of Black women of faith pursuing their doctorates in engineering. For study participants, spirituality offered a lens through which they saw, understood, and operated in the world. Their faith was not confined to particular space or time in their lives, but rather it informed their ongoing decisions, interactions with others, and sense-making. Spirituality also empowered participants to engage in resistance, resilience, and transcendence in engineering doctoral programs. Participants' faith emboldened them to exercise agency, assert themselves in advising relationships, employ spiritual strategies to combat mistreatment; while also encouraging them in trying times and reminding them they were overcomers. Moreover, spirituality helped many of these Black women find meaning and purpose in their engineering work, and see alignment between their spiritual and scientific epistemologies. Rather than divorcing the sacred from science, the majority of participants actively reconciled the two, recognizing how they could inform one another. Though spirituality appears to be central in the lives of Black women in the study, spirituality remains understudied in education research and warrants further investigation. This study is a cross-sectional, qualitative examination of the experiences of 16 Black women at various stages of their engineering doctoral education conducted over a six-month period. Longitudinal qualitative research that follows the trajectories of Black women in engineering

from the beginning of their doctoral programs to the end, and perhaps into their careers, could provide additional insight into how their spirituality developed over time. Future research should also examine how Black women's conceptualizations of spirituality are translated into behaviors in their educational environments. For instance, considering the relationship between self and others as one aspect of spirituality, researchers could explore how Black women's spirituality influences their participation in design teams, research labs, and group work. Regarding the connection between the self and transcendent forces, researchers could conduct longitudinal studies investigating Black women's career trajectories post-graduate education and the relationship between purpose, or a sense of calling, and Black women's professional pathways.

This study also has implications for interventions in engineering education. All of the women in this study mentioned that their participation in this research was one of the only opportunities they had for conversations concerning their faith in relation to their engineering work. Participants also expressed interest in connecting with other Black women of faith to learn more about their experiences and build relationships. Establishing spaces where Black women of faith in engineering, and STEM more broadly, can engage one another and have the opportunity to articulate their spiritual epistemologies and ontologies in relation to their science could support Black women in aligning the spiritual with the scientific. Moreover, Black women could use such groups to exchange strategies and resources, as well as establish support networks. The relationships cultivated in these spaces could help Black women combat feelings of imposterism and a lack of belonging in the field, while promoting their mental health and overall well-being. As legacies of racism and sexism continue to pervade in predominantly White and male disciplines such as engineering, creating spiritual counterspaces within engineering that center

alternative ways of knowing and being can be affirming, generative sites for Black women of faith.

Additionally, engineering schools and departments must address climates and cultures that marginalize Black women and delegitimize their spiritual epistemologies and ontologies. Being inclusive of Black women's ways of knowing and being would not only contribute to Black women of faith's ability to flourish, but likely all students. Engineering departments should promote a healthy work/life balance among their students, which needs to be modeled by faculty members. Participants in the study expressed finding it challenging to balance the demands of their engineering programs with their spiritual practices. However, if students did not feel the pressure to prioritize their academics and research at the expense of their spirituality and personal lives, then setting aside time for the practices that kept them grounded would not be sacrificed. Engineering schools and departments should also be more intentional about recruiting and retaining Black women. Participants' feelings of not belonging and discomfort occupying spaces where they are jarringly underrepresented could be mitigated through strategic efforts to recruit more Black women and promote their successful matriculation from the institution. To prevent incoming students from being one of few, or the only, Black women in their departments, departments should consider recruiting Black women in clusters. Having peers with whom they could identify might help Black combat feelings of isolation.

Engineering programs should also demonstrate an openness to alternative ways of knowing beyond positivism. Inviting scholars who utilize alternative epistemologies from the social sciences (e.g. critical, Black feminist, indigenous etc.) to share their research and help draw connections between their scholarship and science could introduce engineering communities to other ways of knowing that expand their paradigmatic perspectives. In addition

to invited talks, social scientists and engineers could work together to develop curriculum that includes diverse authors and epistemologies. Such curricular changes would allow Black women to see themselves represented in course material, and perhaps combat feelings of imposterism as they engage readings and scholars that uplift Black women as purveyors of knowledge. Furthermore, faculty members and advisors should be mindful of the ways irreligiosity and atheism become conflated with "good" science and scientists. For example, Taryn explicitly said that one might be perceived as less intelligent for believing in God in STEM fields which reveals the delegitimization of spiritual ways of knowing in scientific communities, particularly for members of marginalized groups. Critical race theory would suggest that Black women contend with multiple layers of oppression within their predominantly White and male academic environments. Persistent dominant narratives that emphasize racist notions of Black intellectual inferiority, coupled with racialized sexism create unwelcoming climates for Black women's spiritual ways of knowing. Thus, in academic spaces where Black women are already sorely underrepresented and often minoritized, it is possible that Black women may be less inclined to publicly convey their spiritual beliefs for fear of being further ostracized. Participants' perceptions that spirituality was disassociated from intellect in their academic environments could be addressed by advisors reinforcing that there is room for spiritual and scientific epistemologies to co-exist and one's faith does not undermine her identity as a scientist. Faculty members who subscribe to particular faith traditions openly sharing the ways they think about their spirituality and science would not only invite their students to engage in such topics, but might encourage their colleagues to consider how alternative ways of knowing can operate in concert, rather than conflict with scientific epistemologies. Also, cultivating mentorship relationships where Black women are invited to discuss their career ambitions in relation to their

sense of purpose could help Black women, and other students, find alignment between their spirituality and engineering work with the support of trusted advisors. Any student interested in serving the common good, and bridging their personal values with their engineering work and research, could find such advising relationships beneficial.

This study also has important implications for Black women and other students with alternative ways of knowing in engineering graduate programs. Black women in this study demonstrated that spiritual epistemologies and ontologies can contest prevalent scientific epistemologies like depoliticization and meritocracy as well as rationality and neutrality. Participants' spiritually motivated commitments to social justice encouraged them to take action and seek change in their academic environments and local communities. Additionally, participants' attributions of their success to the faith-based support of their friends and family, as well as beliefs that their work was divinely inspired challenged meritocracy. By allowing their spiritual epistemologies and ontologies guide their behaviors and sense-making in engineering academic contexts, Black women in this study made room for other ways of knowing in their educational environments. As Aliyah shared, simply knowing that there were other spiritual people such as herself that persisted in engineering careers gave her hope for her future in the field and encouraged her to find purpose in her educational pursuits. Thus, simply being present in the field and remaining true to one's spiritual epistemologies and ontologies could inspire others to do the same, which could gradually shift engineering cultures.

Additionally, bridging one's scientific and spiritual epistemologies, values, and work can support a sense of purpose in engineering. Black women in this study who were able to find alignment between spirituality and engineering felt more committed to the field and could imagine how engineering may be related to their life's purpose. As previously discussed, the

search for meaning and purpose in one's life was a key aspect of Black's spirituality as conceptualized in the literature (Mattis, 2000; Stewart, 2002). Thus, believing one's profession could be a pathway to fulfilling one's purpose could be highly motivating in times of doubt and challenge. For instance, Cadence believed that her purpose was to help others and that in completing her engineering doctorate and perhaps becoming a faculty member she could help future students. This belief allowed her to remain persistent in the pursuit of her academic goals and encouraged that she was on the right path in life.

Finally, finding and creating spaces to articulate one's spiritual epistemologies and ontologies can be empowering and healing. During the third and final interviews with participants, I asked if and how participating in this study impacted them. Overwhelmingly, participants shared that being able to share their experiences and discuss their spirituality in relation to their engineering work was cathartic and even therapeutic. Black women in the study valued having the opportunity to speak their truths aloud and be heard. Establishing informal spaces to engage others in dialogue about ones' spiritual epistemologies and ontologies could be a useful strategy to help graduate students develop support networks, as well as meaningfully reflect upon and validate their ways of knowing in the company of trusted others.

Study Contributions

In addition to being one of the only studies, to my knowledge, of Black women's spiritual epistemologies and ontologies in the context of engineering doctoral programs, this research has clear theoretical and methodological contributions. Theoretically, this study weaved together elements of critical race theory, Black feminist thought, endarkened feminist epistemology, and critical religious scholarship to effectively answer the research question of what is the role of spirituality in the lives of Black women in engineering doctoral programs. Bringing these

frameworks together was essential in unearthing the complexity of participants' spiritual epistemologies and ontologies, as well as their experiences in their academic contexts. While critical race theory provided a sociohistorical foundation for the ways in which racial dominance is produced and preserved in institutions of education, it did not address the particularities of Black women's experiences at the intersection of racial and gender oppression, nor how Black women produce, assess, and validate knowledge. Black feminist thought addressed this gap, and highlighted the importance of dialogue in revealing Black women's ways of knowing. Additionally, by incorporating endarkened feminist epistemology and critical religious scholarship into my conceptual framing of the study, I was able to better investigate how spirituality may operate in the lives of Black women in potentially marginalizing educational environments. This study also raises theoretical questions of how Black women develop critical, spiritual ontologies and epistemologies. For instance, participants such as Parker, Kala, and Nadia, espoused spiritual beliefs that challenged dominant narratives that depicted God and God's chosen people as White, and instead engaged in spiritual counterstorytelling that centered Black people, and particularly Black women in their imaginings of God and themselves as God's children. Moreover, this study provides insight as to how Black women's spiritual and scientific epistemologies and ontologies may co-exist, and occasionally interact as they perform their engineering work. For instance, Taryn scientifically believed in the plausibility of the Big Bang while spiritually believing that God could be the initiator of the bang. Also, Aliyah believed that some things could not be explained scientifically, but scientists could be divinely inspired—as she was—in their professional work. This study uniquely centers spirituality in critical scholarship pertaining to graduate student experiences in engineering, and also foregrounds the

importance of epistemology and ontology in participants' perceptions of and responses to their academic contexts.

Methodologically, Black feminist ethics of accountability and care (Hill Collins, 2000) and endarkened feminist epistemology's methodology of surrender (Dillard, 2006) allowed me to engage in a research praxis that was intentional, ethical, and humanizing. Attending to love, compassion, ritual, and reciprocity throughout the data collection and analysis process encouraged me to truly listen to participants' truths, find ways to bring them joy, remain attuned to my own spirituality, and seek out opportunities to give back to my participants. Additionally, enacting and ethic of care and accountability involved exercising empathy, addressing emotion during interviews (both my own and that of participants), and being responsible for my words, actions, and writing as a researcher. The use of Black feminist thought and endarkened feminist epistemology to frame my philosophical and methodological approach to research enriched the study and allowed me to foster meaningful relationships with my participants. Guided by Black feminist thought and endarkened feminist epistemology, I was able to reimagine the research enterprise as a spiritual endeavor (Dillard, 2006), which required intentionality and care in every stage of the research process, from the study conception to the data collection, analysis, and presentation of findings. I also found Black feminist thought and endarkened feminist epistemology to be complementary to the methods described in portraiture (Lawrence-Lightfoot & Davis, 1997), which required the search for goodness in participants' lives and stories, as well as the creation of authentic, multilayered portraits of participants rendered through attentiveness to context, voice, relationship, emergent themes, and the aesthetic whole. Bringing these frameworks together with portraiture also led me consider new possibilities for crafting participants' portraits and conveying the study findings, namely the use of spoken word poetry.

The usage of spoken word in the study to create a mosaic of participants' experiences was a unique and valuable extension of portraiture. Spoken word allowed me to work through the challenges of portraying the various contexts, narratives, and experiences of my participants in a cohesive, coherent manner. With spoken word, I was able to creatively integrate themes across participants in the poems, while maintaining the integrity of their narratives and honoring the spirit of our conversations. The poetry in this dissertation is the essence of my dialogue with participants in word and feeling. Describing her inspiration for the method and her own experience being the subject of a portrait, Lawrence-Lightfoot (1997) writes:

> I was never treated or seen as an object, but always as a person of strength and vulnerability, beauty and imperfection, mystery and openness. The artist needed to be vigilant in capturing the image, but always watchful of my feelings, perspective, and experience. I learned, as well, that the portraits expressed a haunting paradox, of a moment in time and of timelessness. In the portrait of the young woman, for example, I could see myself at twenty-five, but I could also see my ancestors, and the children in my future. Time seemed to move through this still and silent portrait of a woman, rendering the piece—now twenty-five years later—both anachronistic and contemporary. (p. 4)

According to Lawrence-Lightfoot and Davis (1997) portraiture in research requires the same vigilance and attentiveness to feelings, perspective, and experience to render an accurate and thoughtful portrait of participants, which I aimed to do in this study.

Additionally, Lawrence-Lightfoot and Davis (1997) state that a clear motivation for portraiture is to make research more accessible for audiences within and outside of academia. My use of spoken word not only helped me to synthesize my research findings, but also disseminate my research in a way that could resonate with wide-ranging audiences. Furthermore,

spoken word gave me the freedom to tell participants' stories in style and language that breathed life into their narratives and authentically represented me as an artist and scholar. Though poetry is medium through which I express my artistry, I am deeply inspired by the work of Black portraitists such as Kehinde Wiley and Amy Sherald. With paint and canvas, these artists vividly and honorably depict Black people.

In discussing their art, Wiley and Sherald both have mentioned the importance of engaging in empathy and care in the thoughtful rendering of Black life. The artist responsible for painting the presidential portrait of Barack Obama, Wiley once said in an interview:

> I think the starting point of my work is decidedly empathy…All of it is a self-portrait. I never paint myself but, in the end, why am I going out of my way to choose these types of stories and narrative…It's about seeing yourself in other people. (Sayej, 2019)

In describing the role of caregiving in her art, Sherald— the portraitist known for her portrait of Michelle Obama—said, "In a sense I try to take care of the viewer, to see a self reflected back. That's a loving self, a gentle presentation of Black identity" (Byrd, 2018). Much like these artists with their work, the portraits I created for this dissertation were written with great empathy and care. My sincere hope is that my participants and those who read this dissertation see themselves reflected in the stories herein, and find my rendering of the portraits to be authentic, loving, and gentle.

Conclusion

This study demonstrates the centrality of faith in the lives of Black women pursuing doctorates in engineering and encourages continued research regarding the spirituality of Black women in STEM. For Black women in this study, spiritual epistemologies and ontologies indeed promoted their resistance, resilience, and transcendence in response to the oppressive forces

operating in their academic environments. Spirituality also imbued most participants' engineering work with purpose and strengthened their resolve to persist and thrive within their fields. As postulated, spirituality was a valuable resource for Black women in this study and merits deeper investigation in engineering education research. Additionally, in considerations of how to cultivate more diverse, equitable, and inclusive STEM cultures and climates, spirituality should be meaningfully taken up in the discussion.

Black women in this study bridged spirituality and science, challenging Western notions about their diametric opposition. Both the sacred and scientific shaped how they understood and operated in the world. Though histories of science in the U.S., attempt to obscure and minimize Black women's contributions, participants in this study are members of an enduring legacy of Black women who forged pathways for themselves in STEM fields. Furthermore, these women relied on their legacies of faith and current spirituality to light the way. As suggested by the title of this dissertation, engineering doctoral programs may seem like unexpected places for Black women's spiritual epistemologies and ontologies to emerge, but just like water flowed forth from the rock in the Bible, so too did the faith of participants in this study.

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APPENDICES

APPENDIX A.

SAMPLE RECRUITMENT EMAIL

SUBJECT: Requesting Your Support for Research Study Recruitment

Greetings National Society of Black Engineers,

My name is Christina Morton and I am a doctoral candidate at the University of Michigan. I am writing to request your support in recruiting interview participants for my dissertation study. The purpose of the study is to understand the role of spirituality in the lives of Black women in engineering doctoral programs.

Participants in this study must meet the following criteria: 1) self-identify as Black women, or women of African descent; 2) be currently enrolled in either a historically White or a historically Black institution; 3) be pursuing a doctoral degree in engineering (any discipline) and 4) self-identify as a spiritual person, however they choose to define that term. Participants may be in any stage of their doctoral programs (e.g. pre-candidacy and post-candidacy), however, participants who have completed at least one semester of doctoral study prior to the start of interviews are preferred.

If you could please share this message with your current membership, I would greatly appreciate your help. Additionally, if you, or someone you know, meets the criteria for this study and is interested in participating please contact me, Christina Morton, at cspr@umich.edu.

Thank you for your consideration!

Christina S. Morton

APPENDIX B.

SEMI-STRUCTURED INTERVIEW PROTOCOL

First Interview

Thank you for agreeing to participate in this study. The purpose of this project is to learn more about the role of spirituality in your life as a Black woman pursuing your doctorate in engineering.

Also, if I ask a question that you are uncomfortable answering please let me know. I do not anticipate asking you anything that will make you uncomfortable, but if I do, feel free to say that you would prefer not to answer. Is there anything that you would like for me to clarify before we begin?

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1. To get us started, could you tell me what your discipline is and share your research interests? Also, to confirm how far along are you in your studies?

2. What motivated you to study engineering?
    a. And what made you decide to pursue a doctorate in engineering?
    b. What do you value about engineering studies?
    c. How do your engineering studies align with your personal values?

3. What led you to pursue your doctorate in engineering at this particular institution?
    a. What or who helped you make this decision to attend this university?

4. Shifting gears, as you know, I am interested in the role of spirituality in the lives of Black women in engineering doctoral programs. I would like to start by learning more about your sense of your own spirituality. So, what does being a spiritual person mean to you?
    a. What are ways that you express your spirituality?
    b. Do you distinguish spirituality from religion? If so, how?
    c. How has your spirituality developed?

5. How did you learn about spirituality or religion?
    a. Who influenced your understanding of spirituality (e.g. family, friends, faith-based community)?
    b. What were your experiences with spirituality growing up?
    c. When did you become aware of your spirituality?

6. How would you describe the role of spirituality in your life?
    a. How does spirituality influence the way you operate in and see the world?
    b. When do you find yourself tapping into your spirituality?

    c. Where and with whom do you feel most spiritual?
    d. How does your spirituality contribute to your sense of joy?

7. Do your social identities, for example your race, gender, or sexuality, influence your understanding of spirituality?

8. How has your spirituality typically played a role in your academic experience?
    a. While in school, when do you think about your spirituality?
    b. Who do you feel comfortable discussing your spirituality within your academic community?
    c. How has your spirituality helped you make sense of your experiences in your engineering doctoral program?

9. Have there been times in your work when you have had important breakthroughs?
    a. How did you make sense of those moments as a spiritual person?

10. Have there been things that happened in your work as an engineer that you could not explain? Please describe those moments and experiences.
    a. As an engineer, how do you make sense of those experiences?
    b. As a spiritual person, how do you make sense of those experiences?

11. Have there been times when you turned down opportunities, or decided not to do project, because of your spirituality?
    a. If yes, what was the opportunity and how did you make the decision to turn it down?
    b. Would you still make the same choice today, and why or why not?

12. Have there been times when you decided to take an opportunity, or do a project, because of your spirituality?
    a. If yes, what was the opportunity and how did you make the decision to accept it?
    b. Would you still make the same choice today, and why or why not?

13. Please describe a time when you were experiencing a difficult time in engineering, how did your spirituality help you?
    a. How did you tap into your spirituality during that time (e.g. prayer, worship, fellowship with others)?
    b. How did your spirituality help you? How did you feel after tapping into your spirituality? What insights or direction did you receive?
    c. What was the outcome of this situation? What happened?
    d. How might that moment or experience have been different if you did not have a sense of faith?

14. How does your spirituality help you manage uncertainty, or unknown challenges, in your work?

15. Describe at time, when you felt you were at your best, or thriving. What role did spirituality play in your life at that time?
    a. How does your spirituality help you be at your best, or thrive?

16. Earlier you helped me understand why you are pursuing a PhD in engineering. I heard you say …[summarize participants earlier comments]. Now I want to ask whether, and perhaps how, your spirituality played a role in helping to foster that/those desires?

17. Would you say you have an overarching sense of purpose in your life? If so, how does your work in engineering relate to your sense of purpose in your life?
    a. If not, how do you see an engineering doctorate fitting into your life plans?

APPENDIX C.

PHOTO ELICITATION AND AUDIO JOURNAL PROMPTS

Thank you for agreeing to participate in this study. The purpose of this project is to learn more about the role of spirituality in your life as a Black woman pursuing your doctorate in engineering.

For this portion of the project, I am asking you to take photographs and write journals in which you both describe each photo and share your reflections about what you photographed. Your journals are meant to capture your thoughts and feelings shortly after taking your photographs. Please upload your photos and journals to the designated site by _____. During our second interview, we will discuss your photos and journals more in depth.

1. Please take a photograph of a space that you frequent inside of your engineering department. Write a journal describing what typically happens in this space and how this place makes you feel. Would you feel comfortable talking about your spirituality here? Why or Why not?

2. Please take a photograph of a space that you believe represents your engineering department and another photo that represents the engineering school. Write a journal explaining why you believe these spaces are representative of your department and engineering school, respectively. How does entering these places make you feel? Do you feel welcome in these places? Why or Why not?

3. Please take photographs of the spaces where you feel the MOST spiritual on and off campus. After you have taken your photos, write a journal describing where they were taken and why you chose these locations.

4. Please take photographs of the spaces where you feel the LEAST spiritual on and off campus. After you have taken your photos, write a journal describing where they were taken and why you chose these locations.

5. Please take a photograph or provide an existing photograph of yourself that you believe best represents who you are holistically. Write a journal explaining why you feel this photo is representative of you.

6. Draw a timeline of when you worked through an important problem in your work. Then note where spirituality informed the steps, before, during, and after.

APPENDIX D.

SEMI-STRUCTURED INTERVIEW PROTOCOL

Second Interview

Thank you for agreeing to participate in this study. The purpose of this project is to learn more about the role of spirituality in your life as a Black woman pursuing your doctorate in engineering.

During this interview we will be discussing the photos and journals that you shared with me since we last met. If I ask a question that you are uncomfortable answering please let me know. I do not anticipate asking you anything that will make you uncomfortable, but if I do, feel free to say that you would prefer not to answer. Is there anything that you would like for me to clarify before we begin?

---

1. I want you to take a moment and think about the photos that I have asked you to take and the journals that you have done since our last interview. What photos and journals were especially easy for you and why?
    a. Which photos and journals were more difficult for you and why?
    b. Did any of your journal entries surprise you? If yes, which one and why?

2. Previously, I asked you to take a photo that represented your engineering school or department. Do you feel as though you represent your engineering school or department? If yes, how so? If not, why?

3. In a journal prompt, I asked if you feel welcome in the places you photographed. Have you ever experienced a time when you did not feel welcome in your engineering program or school? If yes, when was this and what was happening during that time to make you feel that way? If not, why do you think that is?
    a. Have you ever experienced discrimination at your institution, or in your engineering department, due to your race and/or gender? If yes, please describe what happened.
    b. Does your spirituality help you during these difficult times? If so, how? If not, why do you think that is?

4. Revisiting the photos where you shared that you felt the most spiritual, could you tell me more about what makes you feel spiritual in these places?
    a. When are you most likely to be in these spaces? How often are you in these spaces during a typical week?
    b. Who do you share these spaces with? Do the people that you share these spaces with influence your expression of spirituality? If so, how?

    c. How do you express your spirituality in these spaces?
    d. Do you generally feel as though you can comfortably discuss or express your spirituality on your campus? Why or why not?
    e. Do you talk with others about your spirituality? Who do you typically discuss your spirituality with?

5. I am especially interested in the photos of places where you feel least spiritual on campus. What about these spaces inhibits your spirituality?
    a. What typically happens in these spaces?
    b. When are you most likely to be in these spaces? How often are you in these spaces during a typical week?
    c. Who do you share these spaces with? Do the people that you share these spaces with influence your expression of spirituality? If so, how?

6. Have you ever experienced any challenges regarding your spirituality?
    a. If yes, what was happening during that time?
    b. If not, why do you think that is?

7. Describe a time this academic year when you were especially aware of your spirituality. What was happening during that time? How did you express your spirituality then?
    a. How has this semester been for you personally, academically, and spiritually?
    b. You mentioned a particular moment in your journal when you felt especially spiritual. What made that specific moment stand out for you? Are there other moments that you can think of?
    c. What do you normally do to express or tap into your spirituality during these moments?
    d. Who would you say is around you during those times? Does that person, or those people, keep you connected to your spirituality? If so, how?
    e. When you are especially attuned to your spirituality how do you feel?

8. During especially difficult times during your program, where do you find the strength to continue persisting? Does spirituality play a role?

9. In your journal prompt, I asked you to take a photo that best represented who you are holistically. Do you feel that you can be this version of yourself in your engineering program?

10. Seeing the photos that you have taken and having had some time to reflect, would you change any of the images you took? If yes, which ones, and why?
    a. Are there any other photos that you would have liked to include? What would these photos be of?

APPENDIX E.

SEMI-STRUCTURED INTERVIEW PROTOCOL

Third Interview

Thank you for agreeing to participate in this study. The purpose of this project is to learn more about the role of spirituality in your life as a Black woman pursuing your doctorate in engineering.

This is our final interview for the study. We will be revisiting portions of our earlier conversations and reflecting on our time together. If I ask a question that you are uncomfortable answering please let me know. I do not anticipate asking you anything that will make you uncomfortable, but if I do, feel free to say that you would prefer not to answer. Is there anything that you would like for me to clarify before we begin?

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1. In our first interview, you described spirituality as [pull from interview one] has that definition changed in any way since over the course of this project?
    a. What does being a spiritual person mean to you?
    b. What are ways that you express your spirituality?
    c. Do you distinguish spirituality from religion? If so, how?
    d. How has your spirituality developed?

2. Also, does God speak to you? If yes, how so?
    a. What is that experience like for you?

3. How has graduate school, particularly this engineering doctoral program experience, influenced your spirituality, if at all?

4. Have there been any important breakthroughs, or key moments that you have had regarding your spirituality recently that you would like to share?

5. How does your spirituality shape your identity? For example, who you are as a person, or perhaps who you would like to become?

6. How does your spirituality align with the nature and beliefs of your discipline?

7. In what ways does your spirituality not align with the nature and beliefs of your discipline?

8. Do you identify with a particular religion or denomination? If so, what is it?

9. How would you describe yourself racially and/or ethnically?

10. To confirm, was your undergraduate institution a Predominantly White Institution or a Historically Black College or University?

11. At the onset of the project, you indicated that you would be interested in connecting with other spiritual Black women in engineering doctoral programs. Do you have any ideas or thoughts about how those connections should be facilitated and maintained?
    a. For example, would you be interested in connecting online? Would you like you meet up with others in-person at your institution, or perhaps at other institutions?
    b. How often would you be interested in connecting?

12. How has participating in this dissertation study impacted you?
    a. Since we have started this interview process, have you had any new insight?
    b. Have there been new questions raised for you?
    c. What have you learned, or re-affirmed about yourself as a result of participating in this process?
    d. What will you continue to think about or reflect upon as a result of participating in this process?

13. Is there anything else that you would like to share or add before we conclude this interview?

APPENDIX F.

RESEARCH AND PROTOCOL QUESTION ALIGNMENT TABLE

Overarching Research Question: What role does spirituality play in the lives of Black women in engineering doctoral programs?		
Sub-Research Questions	**Protocol Questions**	**Photo Elicitation/Journal Prompts**
How do Black women in engineering doctoral programs understand, describe, and express their spirituality? When, where, and with whom do Black women in engineering express their spirituality?	Shifting gears, as you know, I am interested in the role of spirituality in the lives of Black women in engineering doctoral programs. I would like to start by learning more about your sense of your own spirituality. So, what does being a spiritual person mean to you? a. What are ways that you express your spirituality? b. Do you distinguish spirituality from religion? If so, how? c. How has your spirituality developed? How did you learn about spirituality or religion? a. Who influenced your understanding of spirituality (e.g. family, friends, faith-based community)? b. What were your experiences with spirituality growing up? c. When did you become aware of your spirituality?	Please take photographs of the spaces where you feel the MOST spiritual on and off campus. After you have taken your photos, write a journal describing where they were taken and why you chose these locations. Please take photographs of the spaces where you feel the LEAST spiritual on and off campus. After you have taken your photos, write a journal describing where they were taken and why you chose these locations.

	How would you describe the role of spirituality in your life? a. How does spirituality influence the way you operate in and see the world? b. When do you find yourself tapping into your spirituality? c. Where and with whom do you feel most spiritual? d. How does your spirituality contribute to your sense of joy? Do your social identities, for example your race, gender, or sexuality, influence your understanding of spirituality? How has your spirituality typically played a role in your academic experience? a. While in school, when do you think about your spirituality? b. Who do you feel comfortable discussing your spirituality within your academic community? c. How has your spirituality helped you make sense of your experiences in your engineering doctoral program? Describe a time this academic year when you were especially aware of your spirituality. What was happening during that time? How did you express your spirituality then? a. How has this semester been for you personally, academically, and spiritually?	

	You mentioned a particular moment in your journal when you felt especially spiritual. What made that specific moment stand out for you? Are there other moments that you can think of? a. What do you normally do to express or tap into your spirituality during these moments? b. Who would you say is around you during those times? Does that person, or those people, keep you connected to your spirituality? If so, how? c. When you are especially attuned to your spirituality how do you feel? Revisiting the photos where you shared that you felt the most spiritual, could you tell me more about what makes you feel spiritual in these places? a. When are you most likely to be in these spaces? How often are you in these spaces during a typical week? b. Who do you share these spaces with? Do the people that you share these spaces with influence your expression of spirituality? If so, how? c. How do you express your spirituality in these spaces? d. Do you generally feel as though you can comfortably discuss or express your spirituality on your campus? Why or why not? e. Do you talk with others about your spirituality? Who do you typically discuss your spirituality with?	

	I am especially interested in the photos of places where you feel least spiritual on campus. What about these spaces inhibits your spirituality? a. What typically happens in these spaces? b. When are you most likely to be in these spaces? How often are you in these spaces during a typical week? c. Who do you share these spaces with? Do the people that you share these spaces with influence your expression of spirituality? If so, how? Have you ever experienced any challenges regarding your spirituality? a. If yes, what was happening during that time? b. If not, why do you think that is? In our first interview, you described spirituality as [pull from interview one] has that definition changed in any way since over the course of this project? a. What does being a spiritual person mean to you? b. What are ways that you express your spirituality? c. Do you distinguish spirituality from religion? If so, how? d. How has your spirituality developed? Also, does God speak to you? If yes, how so? a. What is that experience like for you?	

	How has graduate school, particularly this engineering doctoral program experience, influenced your spirituality, if at all? Have there been any important breakthroughs, or key moments that you have had regarding your spirituality recently that you would like to share? How does your spirituality shape your identity? For example who you are as a person, or perhaps who you would like to become?	
To what extent, and in what ways, does spirituality inform resilience, resistance, and transcendence among Black women pursuing engineering doctorates? a. How do Black women in engineering doctoral programs describe their experience in their educational environment, and how does spirituality help them to navigate the challenges and assets of that context? b. How are race and/or gender implicated in the challenges and successes that Black women in engineering experience, and how does spirituality	Please describe a time when you were experiencing a difficult time in engineering, how did your spirituality help you? a. How did you tap into your spirituality during that time (e.g. prayer, worship, fellowship with others)? b. How did your spirituality help you? How did you feel after tapping into your spirituality? What insights or direction did you receive? c. What was the outcome of this situation? What happened? d. How might that moment or experience have been different if you did not have a sense of faith? How does your spirituality help you manage uncertainty, or unknown challenges, in your work? Describe at time, when you felt you were at your best, or thriving. What role did spirituality play in your life at that time?	Please take a photograph of a space that you frequent inside of your engineering department. Write a journal describing what typically happens in this space and how this place makes you feel. Would you feel comfortable talking about your spirituality here? Why or Why not? Please take a photograph of a space that you believe represents your engineering department and another photo that represents the engineering school. Write a journal explaining why you believe these spaces are representative of your department and engineering school, respectively. How does entering these places make you feel? Do you feel welcome in these places? Why or Why not?

help them to navigate those particular challenges?	a. How does your spirituality help you be at your best, or thrive? In a journal prompt, I asked if you feel welcome in the places you photographed. Have you ever experienced a time when you did not feel welcome in your engineering program or school? If yes, when was this and what was happening during that time to make you feel that way? If not, why do you think that is? a. Have you ever experienced discrimination at your institution, or in your engineering department, due to your race and/or gender? If yes, please describe what happened. b. Does your spirituality help you during these difficult times? If so, how? If not, why do you think that is? During especially difficult times during your program, where do you find the strength to continue persisting? Does spirituality play a role?	
How, if at all, is spirituality implicated in Black women's work as engineers (e.g., in their knowledge claims, in the ways that they understand what is valid, in the creative process, in problem-solving, and in engaging others in collaborative processes)? To what extent do Black women in engineering experience conflicts between	Have there been times in your work when you have had important breakthroughs? a. How did you make sense of those moments as a spiritual person? Have there been things that happened in your work as an engineer that you could not explain? Please describe those moments and experiences. a. As an engineer, how do you make sense of those experiences?	Draw a timeline of when you worked through an important problem in your work. Then note where spirituality informed the steps, before, during, and after.

spiritual and scientific epistemologies?	b. As a spiritual person, how do you make sense of those experiences? Have there been times when you turned down opportunities, or decided not to do project, because of your spirituality? a. If yes, what was the opportunity and how did you make the decision to turn it down? b. Would you still make the same choice today, and why or why not? Have there been times when you decided to take an opportunity, or do a project, because of your spirituality? a. If yes, what was the opportunity and how did you make the decision to accept it? b. Would you still make the same choice today, and why or why not? Earlier you helped me understand why you are pursuing a PhD in engineering. I heard you say …[summarize participant's earlier comments]. Now I want to ask whether, and perhaps how, your spirituality played a role in helping to foster that/those desires? Would you say you have an overarching sense of purpose in your life? If so, how does your work in engineering relate to your sense of purpose in your life? a. If not, how do you see an engineering doctorate fitting into your life plans?	

	How does your spirituality shape your identity? For example, who you are as a person, or perhaps who you would like to become? How does your spirituality align with the nature and beliefs of your discipline? In what ways does your spirituality not align with the nature and beliefs of your discipline?	

APPENDIX G.

DISSERTATION CODEBOOK

Epistemology			
Code	**Full Name**	**Definition**	**Example**
Afro_Wok	Afrocentric Ways of Knowing	Participant discussions of faith and beliefs from an Afrocentric perspective (e.g., believing that the original Israelites were of African descent)	Also, there's some science behind it in terms of the skulls of the people in Egypt, the Hebrews that were buried there. Their skulls match African-Americans, but don't match others, things like that. I believe that I'm a descendant, but I don't share. It's hard to believe something and not share it. It just gives me more faith to know that I'm an important person of God, a person of God. Nadia_1
Def_Spir	Defining spirituality	Participant personal definitions of what spirituality means to them	
Def_Rel	Defining religion	Participant personal definitions of what religion means to them	
Miracle	Miracles	Participant discussions of events that could be considered as evidence of the divine or supernatural intervening on their behalf resulting in a positive outcome	
Spir_Sense	Spiritual Sense Making	Interpreting situations from a spiritual perspective (e.g., taking difficult situation and analyzing it through a spiritual lens "maybe that opportunity didn't work out because it wasn't my time yet) OR explaining the influence of spirituality on decisions and choices	Then I recognized that God saved me from that event and that he has a purpose, and that I guess we don't have to be afraid, because even though this life is temporary and fleeting and there's so much pain, God promises eternal life, which isn't temporary, it's permanent. I decided like okay, I'm going to spend the rest of my life living for God rather than living for this world.

			Maya_2
Sci_Sense	Engineering or Scientific sense making	Interpreting situations from a scientific perspective (e.g., believing that through the scientific method, one could understand or explain anything) OR explaining the influence of scientific thought processes on decisions and choices	Yeah, it's probably like the equivalent of how doctors feel when something or their patient miraculously recovers and they have no idea why. They can't explain it. So, deep down maybe their doctor's lens or in my case my engineering's lens there would be like, "Yeah, there's some logical explanation behind this. I just can't figure out why." –Cadence_1
Sense_Mk	Sense Making more generally	This code speaks to instances where participants are discussing their interpretation or understanding of events or how this sense making influences their decisions or choices	And then another thing I was thinking about today is do you remember when there was some lion in Africa that got shot and it raised a lot of publicity, like people were very, very upset that this lion was shot and killed and around the same time I think it was a Black church that got burned to the ground. I don't remember if there were casualties, but I think there might have been, but I have to check, but I realized that that moment was the moment I realized, to me, and I would love to be proven wrong, that in America an animal's body is seen or perceived as being more valuable than a black body or a group of them. -Nadia_2_
Ontology			
Express_Spir	Expressions of Spirituality	Participants descriptions of how they demonstrate or practice their spirituality (e.g. prayer, meditation, reading religious texts)	Also music is just so, so, so ingrained into my life. I feel like that is one of the main ways that I connect with God, and so every time that I was able to worship, and I was just blessed to have people who I was just able to gel with, especially the second semester where worship was just so good and we were able to just do certain songs that I've never been able to do and will probably never be able to do again until way later. So, I'm like, "All right, I don't know how I'm going to get through the rest of life. I don't know. This is probably lights out," and then I would just go to small group and I was just like, "I guess I have enough to go a little bit further," or when I would do worship and the same would happen Harmony_1
Faith	Enacting Faith	Using spirituality to help overcome problems	I guess, again, going back to knowing who is driving the car and taking the lead, my spirituality allows me

			to have hope that things will work out the way I was told they would work out, even though the facts don't really say that's where I should be. Spirituality gives me hope. Again, this is my final destination and you're going to get there Serenity_1
Transc	Transcendence	The ability to extend beyond the misfortunes and constraints of one's existential condition (examples of this might be participants' discussions of joy)	Yeah, I feel like when ... I guess like if I'm feeling bad about something just remembering that there's something beyond what's going, something much more beyond what I'm currently experiencing. Yeah, kind of like getting a new perspective or a new hope – Maya_1
Soc_Identity	Social Identities Influence	The influence of social identities on the spirituality, or worldviews of participants, along with how social identities may inform their experiences personally, professionally, or academically	
Background			
Undergrad_PWI Grad_PWI Undergrad_HBCU Grad_HBCU	Institutional Type	What type of institution the participant attended for undergrad and graduate school	
Race	Race	What is the race and/or ethnicity of the participant	
Major_Undergrad Major_Grad	Major	What is the undergraduate or graduate major of the participant	
Year_Maj	Year in Studies	What year is the participant at the start of the study	
Age	Age	How old is the participant	
Religion	Religion	What is the participant's religion and/or spiritual belief system	
Background_Spir	Spiritual Background	Discussions of participants' religious upbringing and background	
Background_Ac	Academic Background	Discussions of participants' academic background	
Background_Pers	Personal Background	Discussions of participants' personal background	I guess I'll give you everything. Since you told me what you're doing, I'll just put it out. I'm a first generation college student, so my mom drove trucks and she got her GED. I went to high school like

			normal, and I've always been really introverted. My dad was killed when I was 10, and when that happened it made me this hermit-like child. I didn't really talk to people and I was just in my own little world. Serenity_1
Transitions_Ac Transitions_Pers Transitions_Pro	Academic Transitions, Personal Transitions, or Professional Transitions	Participants discussing important transitional moments, or turning points, in their academic, personal, or professional lives (i.e. growing confident in their ability to succeed in their program)	
Transitions_Spir	Spiritual Transitions	Participants discussing important transitional moments, or turning points, in their academic lives (i.e. important shifts in their spirituality, such as gaining a deeper relationship with God or wanting to read and understand the bible for themselves)	And then, I guess, I don't know when the switch happened, but I started listening to what was actually being said and not groaning throughout it. So, when I start listening I was like, "Hm, maybe there is something useful here." And so I started taking notes during church and I actually still have those notebooks. - Cadence_1
Research_Grad Research_Undergrad Research_HS	Research	Research experience, interests etc.	
Pro_Exp	Professional Experience	Professional experience, internships etc.	
Advising	Advising Relationships	This can include any mentions of one's research or academic advisor as well as any established mentoring relationships	
Eng_Motive	Motivations to pursue Engineering	Discussions of pathways into the field of engineering, what interested them about this professional path etc.	
Doc_Motive	Motivations to pursue one's doctorate in engineering	Discussions about what encouraged them to pursue doctoral level study (likely will be used in conjunction with the Eng_Motive Code)	This was in high school, graduation ceremony, and of the professors, or teachers I should say, was wearing her PH.D regalia, because she had gotten her PH.D. And I was like, "What does she look different from everybody else?" 'Cause you know, you have the Master's and you have the Bachelor's people. I was like, "Yeah, why does she look so cool?" They were like, "Yeah, she has her PH.D." And I'm like, "That looks amazing. I want that." –Cadence_1

Values	Values	What participants value about studying engineering and how personal values align with engineering	I would say I value most of just being able to, I guess, what's the word I'm trying to say? I guess, impact people's lives. So, just that I guess we as engineers we're building things that other people interact with. So, just making other people's lives better so that's something I find very valuable. –Cadence_1
School_Dec_Undergrad School_Dec_Grad	School Decision (undergraduate or graduate school)	How students decided to attend their institution for undergrad and graduate school	
Conceptual Framework			
Purpose	Sense of Purpose	Participant discussions about the meaning of their lives or their life purpose	Yeah, I don't know, he has a purpose for me and I feel like it's being fulfilled through engineering. I really do believe that. I feel like I just sometimes with engineering, I kind of come out of the science more often than a lot of people probably do. I feel like the overall reason for me being an engineer is to be able to just be a representation of what other black girls and boys can be. To know they can do it, I feel like they have to see other people that look like them. Serenity_1
Comm_Infl	Community Influences	Importance of community support, or community influences (e.g., family, friends, loved ones) on one's decision making and actions	
Spir_Infl	Spiritual Influences	Mentions of particular people that have influences a person's understanding of or relationship with supernatural forces, or the divine	
Divine	Connections to the Divine	Discussion of participants' personal relationships with supernatural forces or the divine (e.g. God, angels, ancestors, the universe etc., could also include discussions of how participants hear from supernatural forces)	
Resilience	Resilience	Exhibiting the determination to overcome various obstacles and challenges, be they personal, academic, spiritual, or professional	I think my spirituality promotes that anything is possible. You can get through this program, even though like I said, the numbers don't really make sense and technically people like you don't usually pursue

			these types of careers, spirituality just helps me believe I can finish the program Serenity_1
Resistance	Resistance	Acting against formal and informal power structures in the pursuit of justice, or their personal well-being	
Per_Racism	Persistence of Racism	Evidence of the pervasiveness and consistent influence of racism in their academic, professional, or personal experience	
White_Prop	Whiteness as Property	Whiteness being considered as a commodity that can be possessed, enjoyed, and controlled	
Crit_Lib	Critique of Liberalism	Participants questioning ideas of life, liberty, and the pursuit of happiness for all	
Soc_Jus	Commitment to Social Justice	Evidence of participants personally working toward achieving justice, or fighting injustice) (this may be connected to codes regarding resistance	
Counterstory	Counterstorytelling	Purposeful challenging of dominant narratives about their racial group whether in life of engineering specifically	
Context (Academic)			
Uni_Ctxt	University Context	When participants are mentioning the academic context that they are in, specifically the culture of their universities broadly	
Eng_School_Ctxt	Engineering School Context	When participants are mentioning the academic context that they are in, specifically the culture of their engineering schools broadly	
Dept_Ctxt	Department Context	When participants are mentioning the academic context that they are in, specifically the culture of their academic departments	
Lab_Ctxt	Lab Context	When participants are mentioning the academic context that they are in, specifically the culture of their research labs or workspaces	
Context of Spirituality			
Spir_Pl	Spiritual Places	Places where participants feel as though they can comfortably express or enact their	

		spirituality (this may be a physical/literal or an emotional place for participants)	
NonSpir_Pl	Non-spiritual places	Places where participants feel that they cannot comfortably express or enact their spirituality (this may be a physical/literal or an emotional place for participants)	
Spir_Comm	Spiritual Community	Groups or relationships where one feels as though they can comfortably express or enact their spirituality	
NonSpir_Comm	Non-spiritual community	Groups or relationships where one feels as though they cannot comfortably express or enact their spirituality	
Academic, Personal, or Professional Experiences in Engineering			
Challenge_Ac Challenge_Pers Challenge_Pro Challenge_Spir	Challenges (academic, personal, professional, or spiritual)	Personal, spiritual, professional, or academic problems or difficulties that participants have had to work through in while pursuing engineering PhD	
Succ_Ac Succ_Pers Succ_Pro Succ_Spir	Successes (academic, personal, professional, or spiritual)	Achievements, victories, or breakthroughs that participants have had while pursuing an engineering PhD	
Discrim	Experiences of Discrimination	Discussions of perceived discrimination on the basis of race, gender, or other social identities	
Spirituality and Science			
Eng_Wk_Spir	Spirituality in engineering work [PRACTICAL WORK]	How spirituality informs the work that participants choose to do within engineering and how participants seeing their spirituality operating in their engineering work (e.g. engineering work may allow them to help the environment, and spirituality may encourage them to help keep the plant healthy)	I feel like the overall reason for me being an engineer is to be able to just be a representation of what other black girls and boys can be. To know they can do it, I feel like they have to see other people that look like them. I think that being in engineering and having people reach their potential and all those things all leads to self confidence and people just doing better for the world. That's what Jesus wants. Serenity_1
Tension	Tensions between Academics and Spirituality [PRACTICAL WORK]	These could be moments or experiences when participants feel as though their academic work may be at odds with their ability to enact or tap into their spirituality (e.g. feeling too stressed academically to pray)	

SpirVSci	Spirituality vs. science [IDEOLOGY]	Participant observations of tensions between their spiritual beliefs and understandings than those of engineering (this is more ideological, gets at epistemological differences: e.g. science espousing rugged individualism and spiritual orientation promoting collectivism and looking out for others)	
Align	Spirituality and science alignment [IDEOLOGY]	Participants perceptions of congruence between science and spirituality (e.g., Science being used to help better understand God's creation) also more ideological	
SpirVWorld	Spiritual beliefs vs. the World's beliefs [IDEOLOGY]	ideological tensions between spiritual ways of thinking and the world's ways of thinking. Or even more specifically, struggling with managing the tensions of personal beliefs and spiritual beliefs (e.g. supporting gay marriage, backing women's rights etc.)	I think I'm not very good at defining the words, but I think they are the same thing. But there is a difference how the real Gospel and the real faith from what people try to do in the society to try and manipulate people and trying to push their interests. Lailah_1
Method Notes (Methodology of Surrender)			
Love	Love	Moments where my participants and I show love for one another	
Compassion	Compassion	Demonstration of care for participants	
Reciprocity	Reciprocity	Give and take between me and my participants	
Ritual	Ritual	Bringing the spiritual in the interview process	